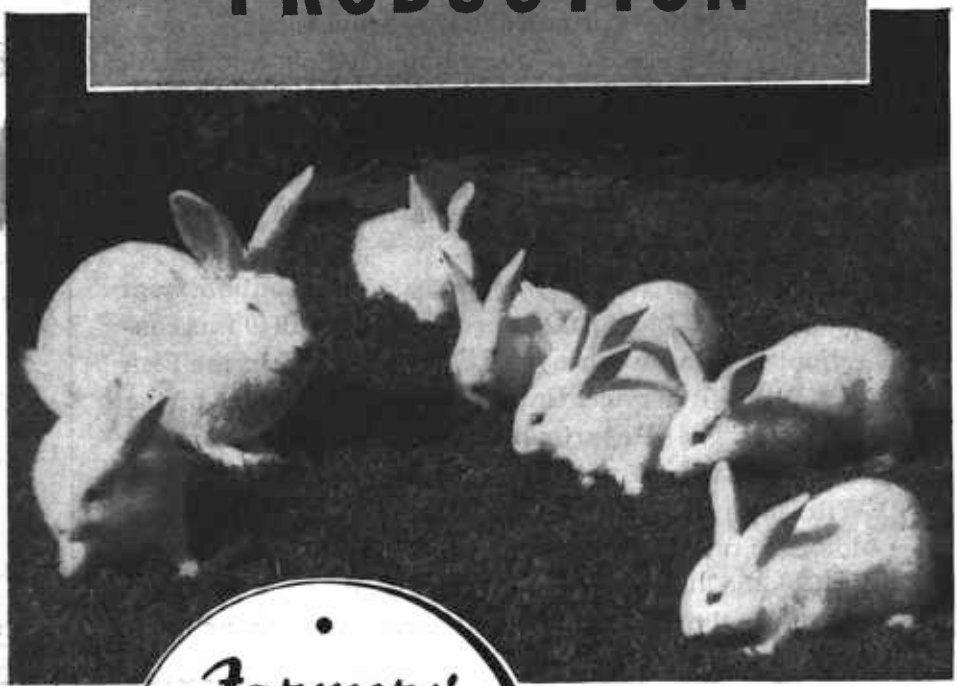
Rabbit PRODUCTION



Farmers' Bulletin No. 1730

U. S. DEPARTMENT OF AGRICULTURE

RABBITS ARE RAISED for food and fur in all parts of the country, but their value in supplementing the family meat supply or in adding to the farm income is recognized in some sections more than in others. The pearly white meat is highly nutritious and palatable and can be served throughout the year. Rabbitskins are used extensively in the hat trade and in making fur garments. No animal is better adapted for use in 4–H Club, Future Farmer, and Boy Scout work.

Improved methods of managing, feeding, and breeding rabbits are being studied at the United States Rabbit Experiment Station, Fontana, Calif. The newer methods of selective self-feeding of whole grains, properly balanced with a protein supplement, have materially reduced the cost of production.

This bulletin was first issued as a contribution from the Bureau of Biological Survey, which, in 1940 was consolidated with the Bureau of Fisheries to form the Fish and Wildlife Service, United States Department of the Interior. That Department revised the bulletin and issued it as Conservation Bulletin 25, Rabbit Raising. With the transfer of investigations in fur farming and domestic rabbits back to the Department of Agriculture, in 1946, the bulletin was reissued with the same contents but under the original title and number.

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RABBIT PRODUCTION[1]

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CONTENTS

INTRODUCTION

RABBIT RAISING is an important industry in the United States. Rabbits are raised primarily for meat and fur, but increasing numbers are being used for biological, laboratory, and other experimental purposes. The production of rabbit wool, a recent phase of the industry, is still in its infancy. Rabbits are excellent animals for 4–H Club, Future Farmer, and Boy Scout work. They also make ideal pets and will continue to be raised as a hobby. The industry lends itself to a wide range of possibilities, from small backyard units of 3 or 4 hutches for supplementing the family meat supply to large commercial rabbitries of several hundred hutches.

RABBIT MEAT AS FOOD

In some sections of the country the consumption of domestic rabbit meat has attained considerable proportions, a market for the meat

[1] This supersedes Conservation Bulletin 25, Rabbit Raising, formerly issued by the Fish and Wildlife Service, U. S. Department of the Interior.

[2] Mr. Templeton, Director, U. S. Rabbit Experiment Station, Fontana, Calif., and Mr. Kellogg, Biologist, formerly in the Fish and Wildlife Service, U. S. Department of the Interior, are now in the Animal Husbandry Division, Bureau of Animal Industry, Agricultural Research Administration. Mr. Ashbrook, Biologist, is with the Division of Wildlife Research, Fish and Wildlife Service, U. S. Department of the Interior.

is well established, and trucks (fig. 1) make regular trips to rabbitries to pick up market animals and deliver them to central slaughterhouses. The meat is available at butcher shops and is served regularly at restaurants, hotels, and hospitals. In other parts of the country there are relatively few places where the meat is displayed and regularly offered for sale. There, rabbit meat is produced chiefly for home and local consumption and the general public is not well acquainted with the product. Once constant supplies are available,

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Figure 1.—**Rabbits collected by truck for transporting to centralized slaughterhouses.**

however, and the good qualities are recognized, the demand should increase.

Domestic rabbit meat is pearly white, fine-grained, nutritious, and palatable and may be served throughout the year. Fryer rabbits weighing 3¾ to 4¼ pounds when weaned and ready for the market at 2 months of age will yield a carcass, including liver and heart, of 50 to 57 percent of the live weight. Roasters—does and bucks that have served their period of usefulness in the herd—when properly conditioned for the market will yield a carcass of 55 to 65 percent.

RABBITSKINS FOR FUR

Regardless of size and color, all rabbitskins have commercial value. They are used more extensively by the fur trade than any other kind of fur. The better grades are dressed, dyed, and sheared

(although some skins are used with the long hair) and made into fur garments and trimmings for women's coats, suits, and dresses. Skins not suitable for garments are used as linings for men's and boys' gloves and in the manufacture of felt hats. Even the fine shreds into which the skins are cut in separating the fur for felt purposes are utilized in the manufacture of glue.

In the manufacture of garments, the skins of rabbits are being substituted for those of wild animals, many of which are disappearing from much of their former range. Fur dressers and dyers have mastered so well the art of imitating the more expensive furs by modern methods of plucking, shearing, and dyeing that the pelt of the rabbit, which lends itself readily to imitation processes, is being offered for sale under a variety of trade names. In many instances it is replacing such costly skins as ermine, seal, beaver, and leopard.

In varieties known as rex rabbits, the normal guard hairs are absent or are shorter than the underfur. Such skins need not be sheared, and if the natural colors are satisfactory, they need not be dyed. The mechanical shearing and dyeing of normal skins is producing greater uniformity than that obtained by breeding operations; consequently, the raising of rex varieties for fur is not profitable.

RABBITS FOR LABORATORY PURPOSES

The increasing demand for rabbits for use in laboratories and for biological purposes offers opportunities to breeders living near hospitals and laboratories. If interested, they should find out from city or county health officials, laboratories, and hospitals in their vicinity the type, age, and size of rabbits desired.

WOOL PRODUCTION

The raising of rabbits for wool is a new phase of the industry, and its future will depend on a satisfactory margin between cost of production and dependable market values. The Angora rabbit produces a wool 5 to 8 inches long within a year's time, and under the commercial practice of shearing four times a year, the wool attains a length of 2½ to 3½ inches each quarter. A mature animal not suckling young will shear on an average about 12 ounces a year. The greatest quantity is produced in winter. Pregnant does should not be sheared over the belly. The wool is reported to be unusually warm and light when made into garments, but, owing to its cost and its fluffy nature, it is used mostly in conjunction with other fibers. The fiber is of a fine texture and takes the delicate pastel shades of dye. In general, Angora rabbits are cared for in the same way as are other rabbits, but special precautions in feeding and management must be taken to obtain a clean fleece free from debris.

UNITED STATES RABBIT EXPERIMENT STATION

The recommendations made in this bulletin are based largely on findings at the United States Rabbit Experiment Station, maintained at Fontana, Calif., by the Bureau of Animal Industry, Agricultural Research Administration. At this station improved methods are developed for producing rabbits with meat and fur of fine quality, for insuring sanitary surroundings, and for preventing outbreaks of parasitic and other diseases. The fundamental principles developed are applicable in any section of the country.

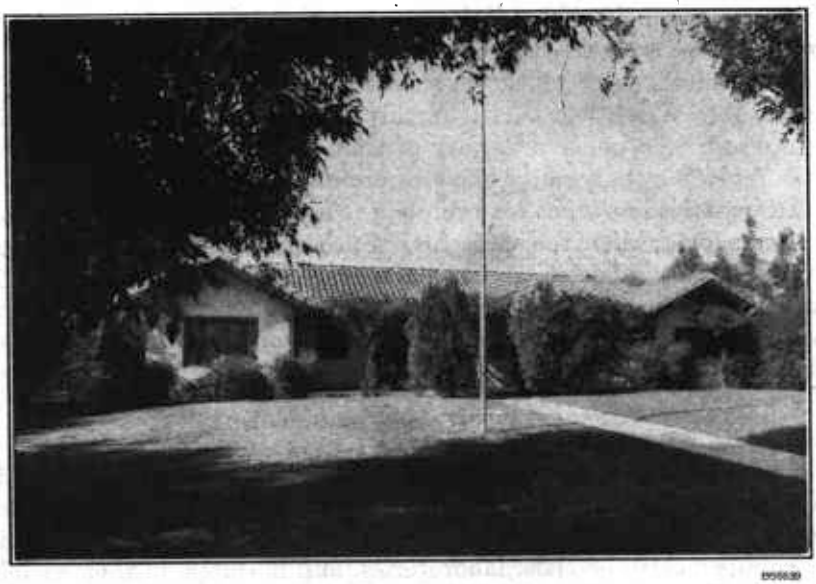

Figure 2.—**Administration and laboratory building, United States Rabbit Experiment Station, Fontana, Calif.**

The equipment of the station, on the site of a 5-acre orange grove, includes an administration building containing offices and laboratories (fig. 2); the superintendent's residence; various open and closed types of houses sheltering hundreds of hutches and cooled on hot days by a sprinkler system; storage houses, in which hay and grain are kept and prepared for feeding; a carpenter shop; a garage; a small slaughterhouse; and a concrete manure pit. About 1,000 to 1,200 rabbits are used at a time in the various experiments, or an aggregate number in excess of 4,000 in the course of a 12-month period. Thousands of rabbit breeders and other interested persons from different sections of the United States and from foreign countries visit the station each year. Fontana, in San Bernardino County, is 50 miles east of Los Angeles, and can be reached by the Pacific Electric

Railway, the Santa Fe Railroad, and United States Highways 66 and 99.

CHOOSING A BREED

A prospective rabbit breeder should first determine in which phase of the industry he wishes to engage—whether in meat and fur, wool, laboratory animals, or fancy stock—and then select the breed best adapted to his needs. Mature animals of the smaller breeds weigh 3 to 4 pounds each, and those of the larger breeds 14 to 16 pounds. In color, also, there is a wide variation, so the breeder may select the breed that will meet his individual preference in this respect.

The American Rabbit and Cavy Breeders Association has set up 51 different standards for breeds and varieties of rabbits, but the beginner in commercial production should make his selection from

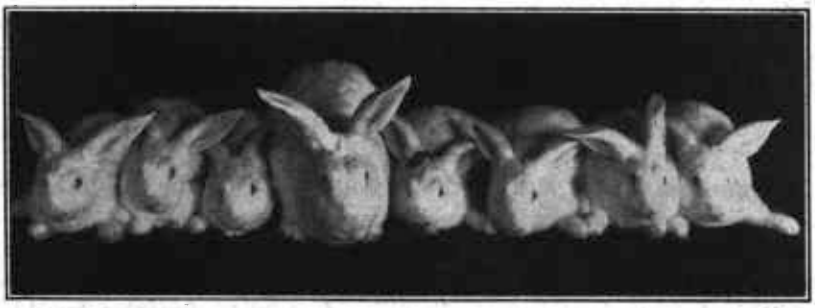

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***Figure 3.*—A New Zealand White doe and her healthy, vigorous, good-type litter.**

only 6 or 8 breeds. Fine distinctions will only be confusing to him, and from a utility standpoint a large number of breeds and varieties will be a handicap to the proper development of his own business and also to that of the industry. The rabbits best suited in size and conformation to the production of meat and fur are such medium and larger breeds as Flemish Giant, New Zealand, American, Beveren, French Silver, and Chinchilla. White rabbits that are satisfactory meat producers are most desirable (fig. 3) because their skins usually bring higher prices in the markets. The preference among white breeds is largely a matter of personal choice.

SELECTING THE FOUNDATION ANIMALS

The beginner in rabbit raising may start with young rabbits just weaned or with mature animals. When young are used for foundation stock, the breeder has opportunity to become acquainted with his animals and their habits before they reach the production stage. It is best to begin on a small scale, with 1 buck and 2 to 10 does, for example, and then expand operations as experience and the market demands justify.

When purchasing breeding stock, it is better to deal directly with reliable breeders; brokers handling live rabbits are seldom able to vouch for the conditions under which their animals were produced. Reliable breeders stand behind the stock they offer and will give references. National, State, and local rabbit breeders' organizations can furnish names and addresses of breeders from whom stock can be purchased, and further inquiries can be made of local chambers of commerce and better-business bureaus. It is contrary to Government policy to vouch for the integrity or the financial standing of any individual or company. The Rabbit Experiment Station is purely a research agency and does not sell breeding stock.

The essential requirements of good foundation stock are: (1) Health and vigor; (2) ability to reproduce profitably; and (3) type and conformation consistent with ability to produce marketable offspring of the desired quality and size. Animals deficient in vitality, even though free from disease, cannot be expected to produce young profitably.

FEEDS AND FEEDING

To maintain health and produce good meat and fur, rabbits must be furnished wholesome feeds that are relished. For a profitable undertaking such feeds should be available at a reasonable cost. Only good-quality, fresh feed should be used; wilted, mildewed, moldy, and dusty feeds are predisposing factors to digestive troubles. Proper feeding is important in lessening losses from disease.

MINERALS AND VITAMINS

Little definite information is available concerning the mineral and the vitamin requirements of rabbits. Unquestionably, a mineral or a vitamin deficiency is less likely to occur if the animals are supplied with a wide variety of feeds that include two or more grains, a plant-protein supplement, a good quality legume hay, green feed or root crops, and salt. It is especially important that the legume hay be bright green in color and leafy and that the green feed or root crop be fresh and sound.

WHOLE GRAINS

The whole grains—oats, buckwheat, wheat, barley, and the grain sorghums (milo, hegari, feterita, sagrain, and kafir)—are palatable and satisfactory for feeding rabbits. In feeding whole corn, considerable will be wasted, for the rabbit will eat the germ part of the seed and waste the hard portion. If the price of corn makes it desirable to use some in the ration, it should be ground into meal.

Ground, rolled, or milled grains are less desirable for feeding rabbits, and when stored they become less palatable and decrease in nutritive value.

Cereal grains are similar in nutritive value, and in the formulas herein suggested one can be substituted for another, pound for pound, without materially changing the feed value. The choice of the grains to be used in a mixture will depend largely on availability and relative cost. The whole grains, however, even when a good quality legume hay also is fed, do not furnish a sufficient quantity of protein.

PROTEIN SUPPLEMENTS

Soybeans, peanuts, sesame, and linseed are rich in protein (35 to 44 percent) and are desirable for balancing rabbit rations. The selection of a protein will depend on availability and cost, but the pea-size oil cake and the meal in pelleted form have equal nutritive value. The former, free from finer parts, is the most convenient form for mixing such protein-rich supplements with whole grains, but in localities where oil cakes are not available the pellets may be used. For rabbits these should be three-sixteenths of an inch in diameter and one-eighth of an inch long. Mills equipped with machines can make the pellets from the meals without adding binding material.

Fresh plant-protein supplement is distinguished by its nutty odor and flavor. Proprietary pelleted rations do not contain a sufficient quantity of protein to permit their use as a protein supplement in a grain ration. If the pea-size oil cake or pelleted protein is not available, it will be necessary to feed the protein as meal and to grind or crush at least half the grains used to make the mixture adhere. The whole should be dampened slightly just before feeding to prevent waste by the meal settling out in the feed trough. This form is not adapted for use in self-feeders, for the rabbits will not consume enough to balance the ration properly.

LEGUME HAYS

The legume hays—alfalfa, clover, sweet clover, lespedeza, cowpea, vetch, kudzu, soybean, and peanut—are palatable and adapted to feeding rabbits. Hay for rabbits should be fine-stemmed, leafy, green in color, well-cured, and free from mildew or mold.

If hay is fed whole, a considerable quantity will be wasted because the rabbits will pull a stem out of the hay manger, eat part of it, and drop the rest. To avoid this wastage and to put the hay in a more convenient form for feeding, the general practice is to cut it into 3- or 4-inch lengths. A convenient home-made equipment for this purpose

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is shown in figure 4, the use of which eliminates dust and the leaf-shattering incident to chopping.

In preparing baled hays for use in large quantities, a hay knife saves considerable time and labor. The bale is placed on a slatted platform (fig 5) for convenience in cutting, and the hay is cut parallel to the bailing wire. Haycutting equipment, both hand and power driven, is available at hardware and implement stores.

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Figure 4.—**A cheap and convenient device for cutting hay into short lengths.**

GREEN FEED AND ROOT CROPS

Green feeds—immature and actively growing plants—are the natural food of rabbits. These are rich in protein, minerals, and vitamins (especially vitamin A) and, being soft and tender, are easily digested. They should be included in the ration to maintain the rabbits in health and vitality.

Rabbits will consume a variety of green feeds, including lawn clippings, rape, cabbage, kale, palatable weeds, waste from garden vegetables, small prunings from fruit or other trees, green cereal or legume crops, and sweetpotato vines. Green feed that can be placed conveniently in a hay manger should not be thrown on the hutch floor, as it may become contaminated and unfit for consumption and be a source of reinfecting the rabbits with eggs of internal parasites. Any green feed not readily consumed should be removed from the hutch.

When green feed is not available, root crops may be used to supplement the grain-hay ration. Carrots, sweetpotatoes, mangels, turnips, and beets are palatable and may be fed fresh or stored to winter use.

MISCELLANEOUS FEEDS

Dry bread and other table and kitchen waste (except meat and greasy and sour foods) are acceptable to most rabbits, and when used as supplements to grain and roughage will add variety to the rabbit's diet. Cow's milk may be used in rations when the cost is not prohibitive, but exceptional care should be taken to prevent it from becoming sour or contaminated and causing digestive troubles. Dry bread mixed with milk is a satisfactory feed for does with young litters and for rabbits being conditioned for shows.

Figure 5.—**A hay knife saves time and labor in cutting baled hay.**

WATER

Rabbits should be supplied with plenty of fresh, pure water. In summer they require large quantities; a 10- to 12-pound doe and her 8-week-old litter of 7 will drink about a gallon in 24 hours. Water should be kept available at all times. When freezing temperatures prevail in the rabbitries, the rabbits should be offered water (not too cold) at least once a day just previous to feeding. The water crocks should then be emptied to prevent freezing.

SALT

Rabbits require more salt than the quantity normally present in the grain and roughage part of their ration. Salt should be available to them at all times so that each animal can satisfy its need from day to day. Small blocks of white salt may be placed in the hutch, or salt may be incorporated in the mixed feed or pelleted part of the ration in the proportion of one-sixth of a pound of salt to each 100 pounds of concentrates.

SUGGESTED RATIONS

RATIONS FOR DRY DOES, HERD BUCKS, AND DEVELOPING DOES AND BUCKS [1]

Ration No. 1

(Northwestern States)

Grain and protein:
- 2 parts whole oats or wheat.
- 2 parts whole barley.
- 1 part linseed, soybean, sesame, or peanut meal.[2]

Roughage:
- Sweetclover or alfalfa hay.
- Green feed or root crops.

Salt.

Ration No. 2

(Central States)

Grain and protein:
- 2 parts whole oats or barley.
- 2 parts whole wheat.
- 1 part soybean or linseed meal.[2]

Roughage:
- Alfalfa, clover, or soybean hay.
- Green feed or root crops.

Salt.

Ration No. 3

(Southwestern States)

Grain and protein:
- 2 parts whole barley, wheat, or oats.
- 2 parts whole milo, hegari, feterita, or kafir.
- 1 part soybean, peanut, sesame, or linseed meal.[2]

Roughage:
- Alfalfa hay.
- Green feed or root crops.

Salt.

Ration No. 4

(Northeastern States)

Grain and protein:
- 2 parts whole oats or buckwheat.
- 2 parts whole wheat or barley.
- 1 part linseed or soybean meal.[2]

Roughage:
- Clover or alfalfa hay.
- Green feed or root crops.

Salt.

Ration No. 5 [3]

(Central States)

Grain and protein:
- 1½ parts rolled oats.
- 1½ parts rolled wheat or barley.
- 1 part corn meal.
- 1 part soybean or linseed meal.

Roughage:
- Alfalfa, clover, or soybean hay.
- Green feed or root crops.

Salt.

Ration No. 6

(Southeastern States)

Grain and protein:
- 1⅓ parts whole oats.
- 1⅓ parts whole wheat.
- 1⅓ parts whole milo, sagrain, or barley.
- 1 part peanut, soybean, or linseed meal. [2]

Roughage:
- Vetch, lespedeza, kudzu, or soybean hay.
- Green feed or root crops.

Salt.

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[1] Whole-grain and protein-supplement parts by weight.

[2] Either in pea-sized oil cake or pelleted form.

[3] Grain and protein mixture should be dampened slightly, just before it is fed, to prevent the meal settling out and being wasted.

RATIONS FOR DOES AND LITTERS [1]

Ration No. 7

(Northwestern States)

Grain and protein:
- 2 parts whole oats or wheat.
- 2 parts whole barley.
- 2 parts linseed, soybean, sesame, or peanut meal.[2]

Roughage:
- Sweetclover or alfalfa hay.
- Green feed or root crops.

Salt.

Ration No. 8

(Central States)

Grain and protein:
- 2 parts whole oats or barley.
- 2 parts whole wheat.
- 2 parts soybean or linseed meal.[2]

Roughage:
- Alfalfa, clover, or soybean hay.
- Green feed or root crops.

Salt.

Ration No. 9

(Southwestern States)

Grain and protein:
- 2 parts whole barley, wheat, or oats.
- 2 parts whole milo, hegari, feterita, or kafir.
- 2 parts soybean, peanut, sesame, or linseed meal.[2]

Roughage:
- Alfalfa hay.
- Green feed or root crops.

Salt.

Ration No. 10

(Northeastern States)

Grain and protein:
- 2 parts whole oats or buckwheat.
- 2 parts whole wheat or barley.
- 2 parts linseed or soybean meal.[2]

Roughage:
- Clover or alfalfa hay.
- Green feed or root crops.

Salt.

Ration No. 11 [3]

(Central States)

Grain and protein:
- 1½ parts rolled oats.
- 1½ parts rolled wheat or barley.
- 1 part corn meal.
- 2 parts soybean or linseed meal.

Roughage:
- Alfalfa, clover, or soybean hay.
- Green feed or root crops.

Salt.

Ration No. 12

(Southeastern States)

Grain and protein:
- 1⅓ parts whole oats.
- 1⅓ parts whole wheat.
- 1⅓ parts whole milo, sagrain, or barley.
- 2 parts peanut, soybean, or linseed meal.[2]

Roughage:
- Vetch, lespedeza, kudzu, or soybean hay.
- Green feed or root crops.

Salt.

QUANTITY OF FEED AND FREQUENCY OF FEEDING

Rabbits eat more at night than during the day. This is especially noticeable during the warm season.

Dry does, herd bucks, and developing does and bucks should be fed once a day all of one of the grain and protein mixtures in rations Nos. 1 to 6 (p. 10) that they will consume readily within 20 to 30

[1] See footnote 1, p. 10.
[2] See footnote 2, p. 10.
[3] See footnote 3, p. 10.

minutes. Does and nursing litters should be given all of one of the grain and protein mixtures Nos. 7 to 12 (p. 11) that they will consume without waste each 24 hours. The quantity fed can be regulated to meet the requirements of any individual or group. If feed is left over, the quantity given at the next feeding should be reduced.

After the litter is weaned, the quantity of the grain mixture fed to the dry doe should be regulated to suit her physical condition.

A good-quality legume hay should be kept before the rabbits at all times.

Green feed or root crops should be fed sparingly to rabbits that are unaccustomed to this kind of feed. To begin with, one-tenth of a pound daily to each doe or buck is sufficient, and if such material is available and economical to feed, the quantity should be gradually increased to what the rabbits will consume readily each day without waste. Green feed and root crops may be from 70 to 90 percent water; consequently, these feeds are bulky and should be used to supplement the grain-hay part of the ration but not to replace it entirely, except for maintaining, under some conditions, mature rabbits that are not in production.

Whether a herd of rabbits should be fed one, two, or three times each day is largely a matter of personal preference and convenience. Regularity in feeding is more important than the number of feedings. When a system has been adopted, it should be adhered to. At the Rabbit Experiment Station the breeding herd is fed grain and protein mixture and green feed in the morning and the rabbits have access to hay at all times. Does and litters are full-fed; that is, they receive all the grain and protein mixture and roughage (shown on p. 11) that they will consume without waste, whether they are hand-fed or self-fed.

The most successful breeders will study the individual animal's food requirements and not attempt to feed all in the herd alike. Some rabbits will need slightly more than the average individual, some a little less. Then, too, occasionally a rabbit will go "off feed." When this happens it is well to reduce the quantity of the ration. The offer of a tempting morsel of carrot, bread and milk, or fresh green feed may induce the rabbit to begin eating again.

FRYER-RABBIT PRODUCTION

Fryer rabbits that have been developed rapidly and properly finished for the market weigh from 3¾ to 4¼ pounds at 2 months of age and will dress from 50 to 57 percent of their live weight. About 77 percent of the product is edible.

FEEDING DOE AND LITTER DURING LACTATION

For rapid development and proper finish of rabbit fryers by weaning time, the doe and litter should be full-fed (either hand-fed or self-fed).

The young should attain the desired weight and finish at about 2 months of age. Does that are excellent mothers will nurse their litters for 6 to 8 weeks. Since young that are weaned and held for several days before butchering may fail to gain or may actually lose weight, they should be left with their mothers until they go to market. This makes full use of the hutch equipment.

COMPARATIVE WORTH OF HAND-FEEDING AND SELF-FEEDING

Full-feeding—whether by hand-feeding the grain and protein mixture or by self-feeding, each ingredient being placed in a separate bin so that doe and litter will have free access to it at all times—insures rapid growth and economical development of the young. The self-fed young are heavier at weaning time than are those hand-fed and require less feed to produce 1 pound of live weight. The increase in weight and the saving of feed in the case of self-fed fryers are due to the fact that the rabbits select the part of the ration that they require at a given time, eat small quantities frequently and slowly, and masticate their food thoroughly. The self-feeding system has the added advantages of saving time and labor, of insuring a more uniform quality of fryer, and of preventing contamination and waste of feed.

HAND-FEEDING OF DOE AND LITTER

The day the doe kindles she should have all the feed she will readily consume without waste of any one of the grain and protein mixtures (p. 11), and she should be given a greater quantity as her capacity and that of the litter increase. Table 1 (below) gives a schedule for determining the approximate quantity of a grain and protein mixture that a 10- to 12-pound doe and her litter of 7 will consume. For example, during the sixth week following kindling, they should be fed 20 ounces of the grain and protein mixture daily—6 ounces for the doe and 2 ounces for each of the young.

TABLE 1.—*Quantity of a mixture of grain and protein to be fed daily to a 10- to 12-pound doe and her litter of seven*

Week following kindling	Grain and protein to be fed to—		Average weight [1] of litter
	Doe	Each of the young	
	Ounces	*Ounces*	*Pounds*
First	5.0		1.9
Second	5.5		3.5
Third	6.0		5.0
Fourth	6.0	0.75	8.0
Fifth	6.0	1.50	13.0
Sixth	6.0	2.00	18.0
Seventh	6.0	2.50	22.5
Eighth	6.0	2.75	27.0

[1] Litter of 7 averages 1 pound at birth.

A doe and litter should at all times have free access to leguminous hay of good quality, salt, and fresh water. When green feeds or root crops are available and are economical to use, the doe may be fed 1½ ounces daily until the litter comes out of the nest box; then she should be fed a gradually increased quantity as the litter develops. These bulky feeds, which contain much moisture, should be used to supplement the grain and protein and the hay rations and not to replace them.

SELF-FEEDING OF DOE AND LITTER

A self-feeder should be given to the doe when she kindles. The ingredients in the grain and protein mixture for the various regions (p. 11) may be used, except ration No. 11, which is not adapted to self-feeding because the finely ground feed would not be readily eaten; but each ingredient should be placed in a separate bin. If the feeds are mixed, the rabbits will select what they desire at a given time and scratch out and waste the other feeds, but if the grains and proteins are placed in separate bins, no feed will be contaminated or wasted.

If the hutch is small (less then 10 square feet of floor space for a 10- to 12-pound doe), placing the self-feeder in it with the nest box would make it too crowded. Under these conditions it would be advisable to full-feed the doe by hand until the nest box is removed and then introduce the self-feeder.

Considerable protein is required by rapidly growing litters and the protein supplements will be consumed in larger quantities than are any of the grains. The self-feeder should be inspected occasionally to make sure that all the feeds are always available.

CONDITIONING ROASTER RABBITS

In some sections of the United States large rabbits are popular for roasting. Well-finished carcasses weighing 5 to 7 pounds or even more are desired. When properly conditioned for the market, roasters—does and bucks that have served their period of usefulness in the herd, or developing breeding stock that has been culled—will yield a carcass of 55 or 65 percent of the live weight. About 75 to 88 percent of this is edible. Roasters may be conditioned for the market by being full-fed rations No. 1 to 6 (p. 10).

BREEDING

AGE TO BREED

The proper age of bucks and does for the first mating depends on breed and individual development. The smaller breeds develop more rapidly and are sexually mature at a much younger age than the medium weight or giant breeds. Does should be mated when

coming into maturity. Some difficulty may be experienced in getting them bred if mating is too long delayed. On the average, the smaller breeds may be bred when the bucks and does are 5 to 6 months old; the medium-weight breeds at 7 months; and the giant breeds at 9 to 12 months. Some individuals within a breed will develop more rapidly than others; therefore, in determining the proper time for the first mating, maturity of the individual is more important than age.

GERM CELLS AND FERTILIZATION

The female egg cells, which are microscopic in size, develop and are released into the Fallopian tubes and uterus through ruptures occurring in the walls of the ovaries. In the rabbit, several egg cells are usually released at one time; consequently, the size of the litter is determined by the number that mature and are fertilized at a given period, and develop to birth. Reproduction begins when the egg cells are fertilized by the male sperm cells. These newly formed bodies, or fertilized eggs, become attached to the walls of the uterus, where they develop.

At each mating, a vigorous normal buck deposits many thousands of sperm cells. The excessive number produced is a provision by nature to insure fertilization, for only one sperm cell unites with one egg cell. Consequently, more than one service to supply additional sperm cells is not necessary, and if some other condition prevents conception, two or more services will not overcome the difficulty. Moreover, there is a distinct disadvantage in allowing more than one service, for excessive use lowers the buck's vitality.

BREEDING SCHEDULE

The breeding schedule to be followed will be determined by the type of production. It would probably be best not to attempt to produce more than two or three litters a year in raising animals for show purposes. The time for matings should then be so arranged that the offspring will be of proper age and development for the show classification. In commercial production for meat and fur, the breeding animals should be worked, if possible, throughout the year. With the gestation period 31 or 32 days and the nursing period 8 weeks, this requires mating the does at the time the litters are weaned. If no "passes" (failures to produce young) occur, it is thus possible to produce four litters in a 12-month period. If the size of the litter is materially reduced for any reason, the doe may be rebred earlier than called for by the regular schedule.

The condition of the individual animal should be used as the index for the proper time of mating. If, upon weaning the litter, the doe is reduced materially in physical condition, she should be allowed to rest until she has regained proper breeding condition.

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MAKING MATINGS

Does give evidence of being ready for first mating by restlessness, nervousness, efforts to join other rabbits in nearby hutches, and rubbing the chin on the feed mangers and water crocks. This condition continues for some time, and as the rabbit has no regularly recurring heat period, matings may be made over a period of time, provided the does are in proper breeding condition and not diseased or in molt. Before mating, both the doe and the buck should be examined to make sure that they are free from disease.

The doe should always be taken to the buck's hutch for service. Difficulty will often be experienced if this procedure is reversed, because the doe is very likely to object to another rabbit being placed in her hutch and may savagely attack and injure the buck. Bucks are slow also in performing service in a strange hutch. Mating should occur almost immediately on placing the doe in the buck's hutch. After the buck mounts and falls over on his side, mating is accomplished, and the doe should be returned to her own hutch.

Occasionally it may be difficult to get a doe to accept service. In such cases it will be necessary to restrain her for mating purposes. To restrain the doe, the right hand is used to hold the ears and a fold of the skin over the shoulders; the left hand is placed under the body and between the hind legs. The thumb is placed on the right side of the vulva, the index finger on the left side, and the skin pushed gently backward. This procedure throws the tail up over the back. The weight of the body is supported by the left hand, and the rear quarters are elevated only to the normal height for service.

Bucks accustomed to being handled will not object to such assistance. It is well also to hold the doe in this way the first few times a young buck is used. This practice will expedite matings and insure ready service in difficult cases.

With a little patience and practice the breeder can so develop the technique under this system as to insure 100-percent matings. This does not mean, however, that all the does will "kindle," that is, give birth to young, but it will help materially in increasing the percentage of those that will, for a great many matings will be made that otherwise would not have been accomplished.

One buck should be maintained for each 10 breeding does. Mature, vigorous bucks may be used two or three times a week for short periods. A breeding record should be made showing date of mating and names or numbers of buck and doe.

GESTATION PERIOD

The gestation period, or the period from mating to kindling, is 31 or 32 days. A very small percentage of litters may be kindled as

early as the twenty-ninth day or as late as the thirty-fifth, but 98 percent of the normal litters will be kindled between the thirtieth and thirty-third days.

FACTORS THAT LIMIT CONCEPTION

Among the causes of failure to conceive are false pregnancy (see p. 18) and sterility; and some of the factors that result in a low percentage of conception are extreme ages, poor physical condition, mating in fall, sore hocks and injuries, disease, and molting.

AGE

Young does may not be sexually mature at the time of service, and old does may have passed their period of usefulness and fail to conceive. The first mating should not be attempted until the does are sexually mature and properly developed. The proper age for first mating has been indicated under the heading "Age to breed." Does should reproduce satisfactorily as long as they maintain good physical condition and satisfactorily nurse their litters. In commercial herds, does properly cared for should breed until they are 2½ to 3 years old. Occasionally, individuals may reproduce satisfactorily for 4 to 6 years.

PHYSICAL CONDITION

Does and bucks that are either abnormally fat or thin will have their breeding powers impaired materially or may become temporarily sterile. The condition should be corrected by adjusting the ration and delaying breeding until the animals are in proper condition.

SEASON

Early spring is the normal breeding season for the rabbit; consequently, a higher percentage of conception will occur at this time of the year than at others. At the United States Rabbit Experiment Station, the highest percentage of conception occurs during February and March and the lowest in August, September, and October.

SORE HOCKS AND INJURIES

Sore hocks and injuries that affect a rabbit's vitality should be corrected before mating is attempted. When the does are out of condition, the percentage that conceive will be low.

DISEASE

Rabbits should never be mated when they show any symptoms of disease. Remove such animals from the herd and hold them in quarantine until they have completely recovered.

MOLTING

Molting is normally in fall, and the percentage of conceptions occurring then is small. At this season rabbits are low in vitality, because of the heavy spring production, the heat of summer, and the additional strain of molting.

The feeding and management practices throughout the year will have an influence on breeding during the molting period. Adequate and properly fed rations will keep the rabbit in the best possible condition, and the molting period in well-fed animals will be much shorter than when the ration has been unsatisfactory. Proper feeding will assist the rabbits again to attain good physical condition, and when they are in full coat many breeding difficulties will be automatically overcome.

STERILITY

Occasionally a sterile rabbit will be found, and other individuals may be rendered temporarily sterile by one or more of the factors already discussed. The breeder should study each case carefully and if possible remove the cause of failure to conceive. Individuals that fail to respond to treatment should be discarded.

FALSE PREGNANCY

Does may be bred or stimulated sexually and shed the egg cells but fail to become pregnant. False pregnancy may be due to an infertile mating or to a sexual excitement caused when one doe rides another. Whether riding or ridden, does may become "false pregnant" and be unable to conceive until the false-pregnancy period is over. The period lasts for 17 days. After 18 to 22 days the doe may give evidence of the termination of false-pregnancy by pulling fur and attempting to make or build a nest.

TEST MATING

Test mating is the returning of the doe to the buck's hutch at stated intervals to determine whether she has conceived. If on being placed in the hutch the doe "growls" and avoids the buck, it is a fairly good sign that she is pregnant.

The breeder of show animals who is making matings for kindling at a definite time and the commercial breeder who is interested in keeping his does working as much of the year as possible can use the test mating system to good advantage.

All does should be test-mated when they pull fur and attempt to make nests 18 to 22 days after mating (false-pregnant does), when they prepare their nests several days in advance of the correct time for kindling and do not keep the nests clean, and when they fail to take on flesh or to show signs of pregnancy.

In view of the fact that a number of does that are bred and fail to conceive may experience false pregnancy, test mating on the eighteenth day after mating will be likely to detect the largest number of does that have failed to conceive. Does may also be test-mated at other times, and it may pay to test-mate a few days after mating as well as on the eighteenth day.

INBREEDING

In response to many inquiries as to whether inbreeding is desirable; that is, whether rabbits that are closely related should be mated, the average rabbit raiser is advised not to attempt inbreeding, for the following reasons:

Inbreeding knows no favorites. It will intensify poor qualities just as readily as it will good qualities.

The average breeder is unable to judge exceptional qualities in his breeding stock and usually does not have the necessary knowledge of the previous history of his animals to know what results may be expected.

Because the rabbits of the average breeder are usually of mixed inheritance, inbreeding such animals will always result in a variety of progeny.

Inbreeding is not harmful in itself, but it is sure, rapid, and effective in revealing the genetic structure of living forms. It will always remain a most potent procedure in developing and improving any breed of rabbits; in fact, no procedure other than close mating with rigid selection can be relied upon unfailingly to fix a type. Inbreeding, however, is a two-edged sword with which the ordinary rabbit raiser cannot afford to play. Discarding all undesirable forms, which is a necessary part of inbreeding, requires courage and considerable financial resources.

LINE BREEDING

Line breeding is the same in principle as inbreeding, except that the matings are made with animals that are not so closely related. Consequently, the characteristics of mated individuals, whether desirable or undesirable, are not fixed in the offspring so rapidly as when inbreeding is practiced. Probably most attempts by the novice at inbreeding or line breeding are made to avoid purchasing a new buck. Rather than take chances of obtaining inferior offspring by making close matings, it would be better for the novice to purchase a new buck of the desired type when it is necessary to breed does that are related to the herd buck.

CROSSBREEDING

Crossbreeding is the practice of mating a purebred rabbit of one breed with a purebred rabbit of another. This form of breeding is

adapted principally to the production of new strains and should be attempted only by breeders with considerable experience.

IMPORTANCE OF HEREDITY

A few fundamental principles of breeding evolved from years of scientific study and observation should be noted carefully. Present evidence indicates that environment has little to do directly with improvement of animal form and that proper care and management practiced over several generations have no cumulative effect in developing a better breed of rabbits. Good feeding and care do, however, have the indirect value of providing a basis on which to select individual rabbits that because of their heredity will respond most satisfactorily to such care and management.

If improvement in rabbits is brought about, it must come chiefly through the hereditary factors transmitted through the germ cells. Effort, therefore, should be concentrated toward improvement by so mating the animals as to recombine these factors in more desirable forms.

The facts in brief are: Thousands of factors, called genes, determine the inheritance of each individual. The genes are collected in groups like beads on a string or like little packets. The groups are called chromosomes. These are of microscopic size, and the number in each cell is definite for each species. In the rabbit the number of chromosomes is 44, made up of 22 pairs. One of each pair comes from the father and the other from the mother.

The numerous breeds of rabbits, differing in size, color, and form, have resulted from various more or less stable combinations of these chromosomes. Frequent new combinations account for off-type individuals cropping out within a breed and explain also the extreme variability noticeable in the newer breeds as compared with older breeds that have eliminated most of the variable factors. The chromosomes frequently exchange genes, and this regrouping permits various recombinations, which are at once the hope and the despair of animal breeders. Without such variations there is no chance of improvement; with them there is no assurance of fixing a type without constantly selecting animals with desirable factors and discarding those with undesirable ones.

Another form of variation, known as mutation, though less common and less important from the breeder's standpoint, has produced types of some of the most important commercial varieties of rabbits. An example is the rex type, in which the guard hairs are either shorter than the underfur or entirely absent. Rex is recessive to the normal coat, and consequently a normal-haired rabbit may possibly be a carrier of rex. Any breed can be "rexed" within three generations by proper matings, if a sufficient number of rabbits are pro-

duced. When the offspring of a normal-haired rabbit and a rex-appearing animal are bred together, 25 percent of the litter will be pure rex, and if those of a New Zealand White and a Castorrex are mated, about 1 out of 16 of the offspring will be both white and rex.

Woolly, or long hair, is another mutation in rabbits. This, however, unlike the rex, is an undesirable trait. Woolly in rabbits is also a recessive, and consequently any rabbit that one suspects of having the woolly character can be tested by mating it with a woolly-appearing rabbit (and therefore pure for this character). If any young rabbits produced from this mating show the woolly character, one can be certain that the animal being tested is a carrier of woolly even though it appears normal-haired. Neither should be used in breeding. This particular type of woolly is different in appearance from that of the Angora rabbit.

MANAGEMENT PRACTICES

Just as in any other business, success in raising rabbits depends upon efficient management. First of all the rabbit raiser should become thoroughly acquainted with his animals—their characteristics and behavior, their likes and dislikes. Consideration for the welfare of animals is always necessary for success in raising them. Proper arrangement of equipment, hutches, and buildings is also essential to efficient management.

METHODS OF HANDLING RABBITS

Rabbits should never be lifted by the ears or the legs. Handling in this manner may cause injury.

Fryer or small rabbits may be lifted and carried comfortably by grasping the loin region gently, yet firmly, the heel of the hand being toward the tail of the animal (fig. 6). This method prevents bruising the carcass or damaging the pelt.

Medium-weight rabbits may be lifted and carried by grasping with the right hand the fold of skin over the shoulders, the back of the rabbit being toward the body of the carrier, and placing the left hand under the rump to support the weight of the animal (fig. 7).

Heavy rabbits may be carried comfortably and prevented from struggling by grasping the fold of skin over the shoulders with the right hand, and lifting and holding the rabbit against the left side of the carrier with its head under his left arm, his forearm being extended along the side of the animal with his hand under its rump to support its weight (fig. 8).

KINDLING

A nest box with a sufficient quantity of straw to make the nest should be placed in the hutch 27 days after mating. A day or two

before kindling the doe usually consumes less food than normally. She should be undisturbed and made as comfortable as possible. Small quantities of green feed are tempting to the appetite at that time and have a beneficial effect on the digestive system. Most litters are kindled at night. After kindling, the doe may be restless and should not be disturbed until she has quieted down.

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Figure 6.—**The proper way to lift a fryer rabbit to prevent bruising the carcass or damaging the pelt.**

CARE OF THE YOUNG LITTER

On the day after kindling it is good practice to inspect the litter. Quietly place the hand in the nest box and remove any deformed, undersized, or dead young. If one is careful and quiet in making the inspection, the doe will generally not object to it and there is no danger of causing her to disown the young. If she should become nervous and irritable, place some tempting feed in the hutch immediately after the inspection to distract her attention and quiet her.

There is considerable variation in the size of litters. In the utility breeds litters usually number 7 or 8, but some may contain as many as 12 to 18. For commercial purposes 7 is the ideal number to leave with the doe. If several does are mated at about the same time, the litters can be increased or decreased in number by adjustments within 2 days after kindling. When young are no more than 2 days old, the does do not object to transfers from one litter to another. A larger number of animals can be developed more uniformly if the litters are of the desirable size.

The doe will line the nest with fur from her own body. If she should fail to pull sufficient fur to protect the litter properly, it would be well to pluck some from the region of the hip, side, and under parts. The fur is easily removed at that period.

DOES THAT DESTROY YOUNG

Individual does occasionally destroy and eat their young. In most cases this abnormal appetite is due to a ration inadequate in quality or quantity; in others, to a nervous doe being disturbed following kindling. Proper feeding and handling during pregnancy will do more than anything else to prevent this tendency. A valuable doe that destroys her first litter should be given another chance; if she continues the practice with subsequent litters she should be sold for meat.

Figure 7.—**Proper way to lift a medium-weight rabbit.**

WEANING THE LITTERS

Does that are excellent mothers will nurse their litters for 6 to 8 weeks, and the young will develop more rapidly if they are left in the hutch with their mothers until they are 8 weeks of age. By that time the milk supply will have decreased and the young become accustomed to consuming more feed; and weaning will be less of a shock than if undertaken at an earlier age.

DETERMINING THE SEX

The sexes should be separated at weaning. The sex of young rabbits can easily be determined by pressing open with the thumb and forefinger the sexual aperture just in front of the anal opening.

In does, a longitudinal slit is observed; in bucks the opening is round, and the male organ can be made to protrude.

MARKING FOR IDENTIFICATION

In order to keep records it is necessary to identify each of the breeding rabbits. Tattooing the ears is satisfactory and permanent and, when properly done, will not disfigure them. Instruments for the purpose may be obtained from biological and livestock supply houses. A good type is one in which separate lugs, with a series of numerals, can be inserted into a plierlike handle. Such an instrument perforates the inner surface of the ear in one operation. India, or drawing, ink is then rubbed into these small holes.

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Figure 8.—Proper way to carry a heavy rabbit.

A box (figs. 9 and 10) that is adjustable for restraining rabbits of various sizes is a convenience that makes it possible for one person to do the tattooing. It is constructed as follows:

Two boards, 1 by 8 by 20 inches, are used for the sides and two pieces, 1 by 8 by 6⅛ inches, for the ends of the box. The top board is 1 by 8 by 19⅜ inches and has an opening 2¾ by 3½ inches at the front end to allow the ears to protrude. The top is fastened to the box at the back with a 3- by 2⅜-inch T hinge and at the front with a door hook. The adjustable bottom consists of a board 1 by 6 by 18¼ inches.

One board, ¼ by 4 by 6½ inches, set in slots (see top and section views) is used for adjusting to the length of the rabbit. Two pieces, 2 by 3 by 4 inches, are beveled on bottom and back (see top and front end views) and are nailed in the front upper corners of the box to restrain the rabbit's head.

One piece ½ by ¾ by 7⅝ inches, is nailed to the box at the front end of the top board.

Two pieces of 7-gage market wire, 2 feet long, are bent in a U shape to form springs that are attached to the under side of the bottom board with three small staples. The ends of the springs extend through the end boards (see top and section views). The bottom board can be adjusted to various-sized rabbits and to difference in body depth in front and hindquarters by using the notches in the ends of the box (see top and section views). The bottom notch on the back end should be 1 inch and that on the front end 1½ inches from the lower edge of the box.

CARE OF HERD DURING CRITICAL TEMPERATURES

In almost all sections of the United States high summer temperatures neccssitate some changes in the general care and management

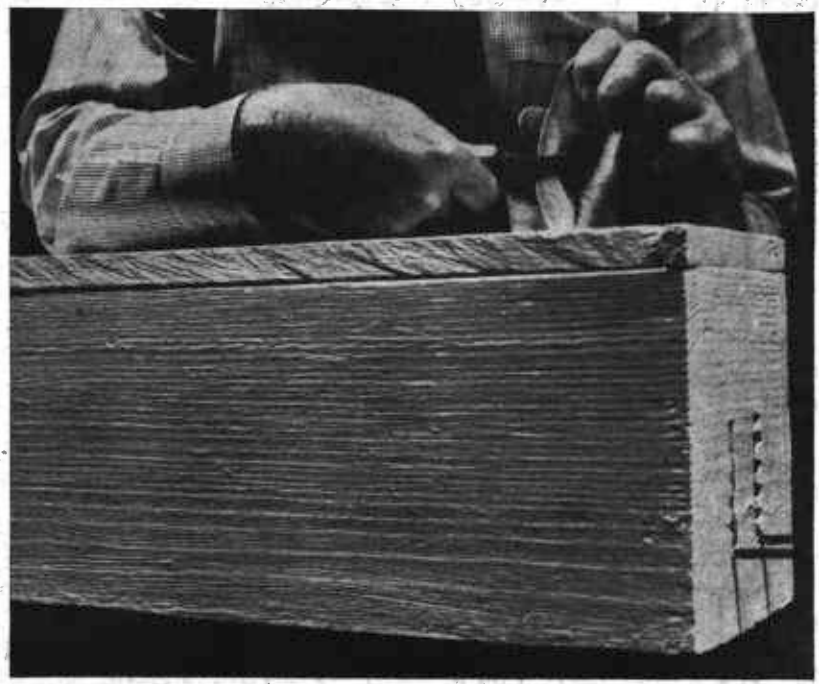

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Figure 9.—**Box for restraining rabbit that is being tattooed.**

of rabbits. Adequate shade should be provided to protect the animals during the hotter part of the day, but rabbits should not be placed where they are totally excluded from sunlight during the cooler hours. Good circulation of air throughout the rabbitry is necessary, but strong drafts and winds should be avoided. An abundant supply of water should be available at all times.

New-born litters and does well advanced in pregnancy are most susceptible to the injurious effects of high temperatures. Heat-suffering among the young is characterized by extreme restlessness; in the older animals, by rapid respiration, excessive moisture around the

mouth, and occasionally slight hemorrhages around the nostrils. Rabbits that show symptoms of extreme suffering from the heat can

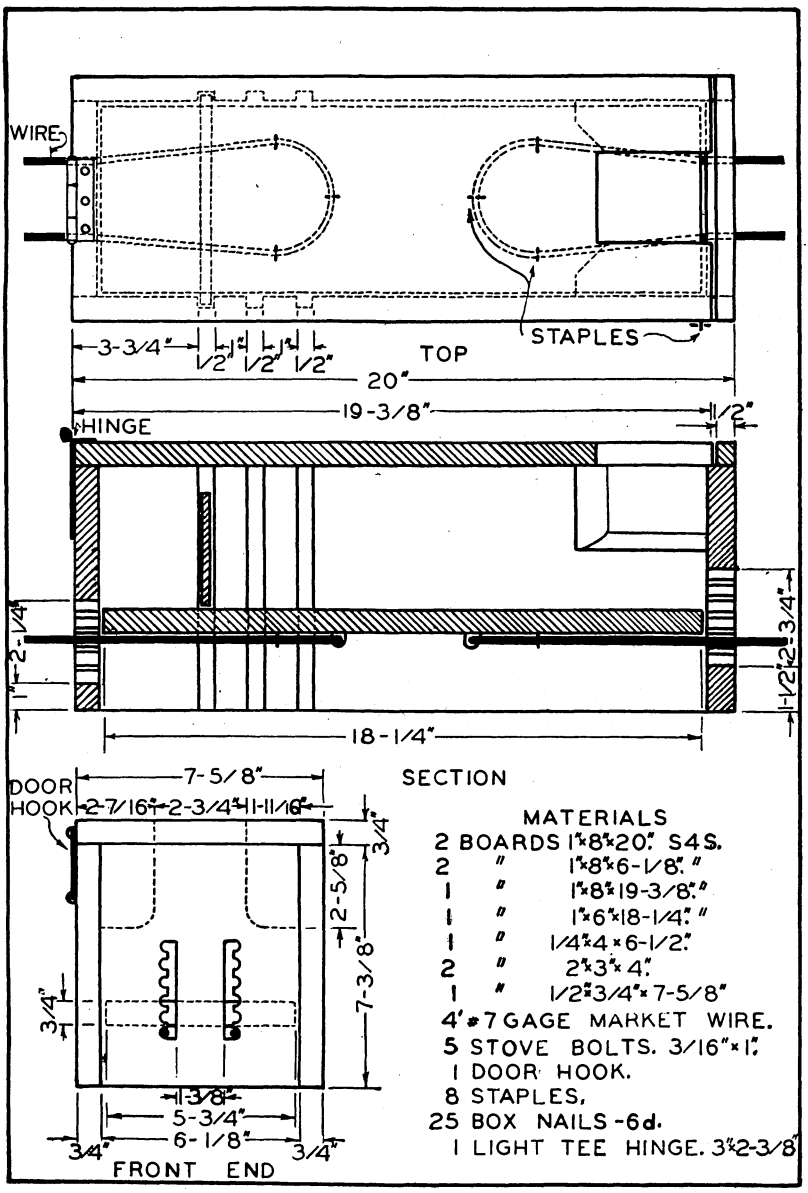

***Figure 10.*—Construction details of adjustable box for tattooing rabbits.**

be relieved by being removed to a quiet, well-ventilated place. They should be given a feed sack moistened with cold water to lie on. In well-ventilated rabbitries, wetting the tops of the hutches and the

floors of the houses on a hot day will reduce the temperature 6° to 10° F. The tops of the hutches should be waterproof, as rabbits must be kept dry. Overhead sprinkling equipment may be used in houses with concrete or soil floors that drain readily.

During the summer, when it is difficult to regulate the quantity of fur in the nest box so the litter can be made comfortable and losses prevented, a cooling basket (fig. 11) provides comfort for the young from the time they are kindled until their eyes are open and they are able to look out for themselves. This basket should be 15 inches

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***Figure 11.*—A cooling basket hung in the hutch provides comfort for the young during hot weather.**

long, 6 inches wide, and 6 inches deep. It is inexpensive, simple in design, and easy to construct. All that is needed is a piece of ⅛-inch-mesh hardware cloth 15 inches long and 18 inches wide; two ¾-inch boards 6 inches square; and two laths 15 inches long, 1½ inches wide, and ⅞ inch thick. Tack the hardware cloth to the sides and bottom of the two square boards. The wire cloth serves as the front, bottom, and back of the basket, while the boards form the ends. To prevent bending, nail the two laths lengthwise, in front and back of the basket, outside the wire, to the sides of the end boards. The top edges of the laths should be flush with the tops of the boards. At the back, insert two screw hooks in the end boards about 2 inches from the top so that the basket can be hung up.

When the temperature is high enough to cause the young to become restless, they should be placed in the basket; it should then be hung up inside the hutch near the top and left for the day. In the evening, when the heat has moderated, the litter is returned to the nest

box. In sections where high temperatures continue throughout the night, the young must be placed in the nest box for a short time in the evening for nursing. They then should be replaced in the basket for the night and allowed to nurse again in the morning.

Mature rabbits, if kept out of drafts, suffer little from low temperatures. Young litters should be provided with warm nest boxes (see figs. 20 and 21, pp. 39 and 40), and plenty of straw should be supplied to enable the doe to build a warm nest.

RABBIT MANURE

The quantity of manure produced in a rabbitry depends on the age and type of the rabbits and the kind of ration fed. A 10-pound New Zealand doe and her 4 litters of 7 each, weaned at 8 weeks of age, will, in 12 months, produce 6 to 9 cubic feet of manure free from litter, the quantity depending on the type of ration. Such rabbit manure when air-dried weighs about 16 pounds a cubic foot. This type of fertilizer is suitable for use with flowers, shrubs, lawns, gardens, and trees.

SANITATION

To protect the health of the herd, the rabbitry equipment must be kept in a sanitary condition. Manure, soiled bedding, and unused feed should be removed daily. The water crocks and feed troughs should be inspected daily. They should be washed frequently in hot, soapy water, rinsed in clear water, allowed to drain well, and then placed in the direct rays of the sun to dry. If, after washing, it is impracticable to sun the equipment properly, it should be rinsed first in water to which a disinfectant has been added and then in clear water.

The mistake of going from hutch to hutch and washing the water crocks and feed troughs with the same brush or cloth and then immediately returning them to the hutches without exposing them to direct sunlight or disinfecting and drying them should be avoided. This practice will serve only to spread disease.

To prevent or control a disease or parasitic infection, the hutches and equipment should be thoroughly disinfected with one of the coal-tar byproducts and allowed to dry before the rabbits are replaced in them.

Nest boxes should be properly cleaned and disinfected before being used a second time.

RABBIT DISEASES

Although maintaining sanitary conditions in the rabbitry is a preventive measure for controlling disease in the herd, the breeder should constantly be on the alert for the appearance of any symptom

that might be an indication of disease. Suspected cases should be isolated and held in quarantine for at least 2 weeks to determine definitely whether they are dangerous to the health of the herd. Newly acquired rabbits and those returned from shows should be placed in quarantine for at least 2 weeks before being put with the breeding herd to insure that they are entirely free from parasites and diseases.

The use of hutches with the self-cleaning type of floor (figs. 16 and 19) and guards on feed troughs (figs. 17 and 19) will prevent rabbits from becoming contaminated from dirty feed and aid greatly in controlling internal parasites.

As effective treatments are known at present for very few of the rabbit diseases, it is usually simpler and safer to destroy a few animals that are sickly than to attempt to treat them and run the chance of their spreading infection to healthy stock. This is especially true of animals with snuffles. For specific information on rabbit diseases write to the Bureau of Animal Industry, Washington 25, D. C.

THE RABBITRY AND ITS EQUIPMENT

The kind of buildings needed for a rabbitry depends upon the location, the climate, and the money to be invested. Whatever the extent of the business, the producer should plan for construction and equipment that will facilitate handling the animals with the minimum of manual labor. Care in feeding, breeding, and handling the rabbits, as well as in cleaning the hutches and keeping the house sanitary, is of the utmost importance. Construction, therefore, should be as simple as possible, and ample provision should be made for light and for fresh air, but strong drafts and winds should be avoided.

In mild climates little protection is required other than a good roof, and the sides of the hutches may be constructed either wholly or in part of wire netting. Where there is much cold weather, additional protection must be provided. This may be achieved by enclosing the sides and back of each hutch with wood or by placing the hutches in a shed or other shelter. Rabbits must also be protected against extremes of heat. This may be done by placing the hutches in the shade of trees, shrubbery, or lattices. Protection against rain, too, must be furnished, for rabbits cannot stand exposure that results in the coat becoming thoroughly wet.

HUTCHES IN GENERAL

To provide individual quarters, rabbit hutches should be designed to meet the square-foot floor-space requirements of mature animals. Hutches should be 2½ feet deep, 2 feet high, and 3 feet long, inside measurements, for the small breeds; 4 feet long for the medium-

weight breeds; and 6 feet long for the giant breeds. The arrangement of the hutches in single, double, or triple tiers is a problem for the individual rabbitry. Where space is not too great a factor, single-tiered hutches are preferable, as they have the advantage of convenience in observing and caring for the rabbits. The two-tier arrangement utilizes space to good advantage and saves time in feeding and caring for the animals. Three-tiered hutches are necessary when space is limited but are not entirely satisfactory for caring for and observing the animals in the bottom and top tiers.

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Figure 12.—**Outdoor hutches for cold climates.**

Rabbits are more easily cared for and less likely to become diseased in well-built hutches than in poorly constructed, temporary ones, which become foul unless often cleaned and rebedded with straw, leaves, or other absorbent. Self-cleaning hutches (figs. 16 and 19) need no bedding and are easily kept in good condition.

Hutches should be so placed as to avoid unusual excitement among the animals. Domestic rabbits are quiet in nature and enjoy being undisturbed, especially during the middle of the day.

Many types of hutches have been used, but the most satisfactory are (1) the semienclosed hutch constructed with ends and back of wood and with an extending roof for protection, used in outdoor rabbitries in the colder climates (figs. 12 and 13), and the same general type of construction but with a more open front, used extensively throughout the Middle and Southern States (fig. 14); (2) the wooden-frame wire hutch, consisting of a wooden frame with front, back, and ends of wire, usually 1-inch-mesh woven poultry wire (figs. 18 and 19); and (3) the all-metal hutch (figs. 16 and 17).

If tightly built shelters are used for the rabbitry, the wooden frame and the all-metal hutches are satisfactory in cold climates, and they are particularly suitable in sheds in mild climates.

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Figure 13.—Hutches in a back-yard rabbitry.

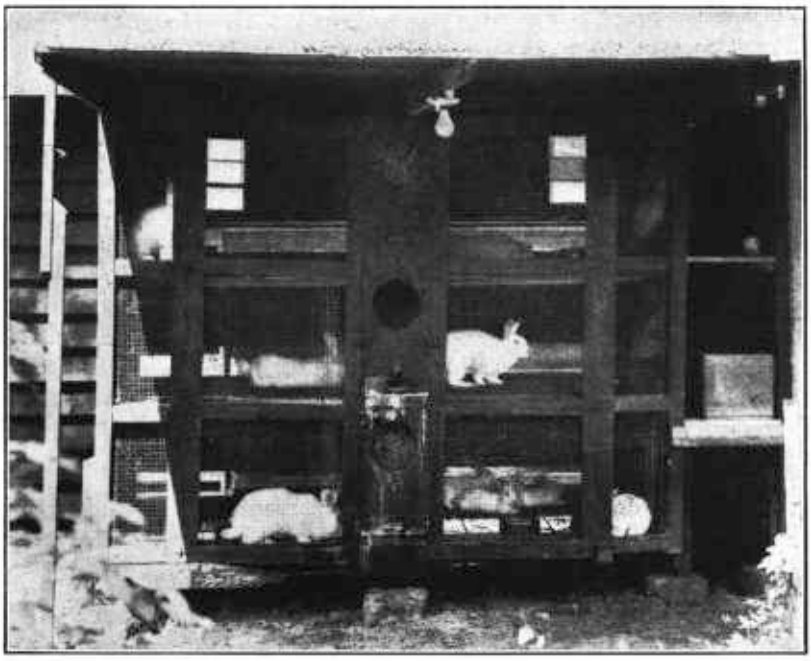

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Figure 14.—Outdoor hutches for the Middle and Southern States.

Hutch floors may be constructed of ⅝-inch-mesh galvanized hardware cloth, 19 gage; perforated galvanized metal; wooden slats varying in width from 1 to 1½ inches and in thickness from ½ to ¾ inch, spaced ⅝ inch apart; or solid boards having a slight slope towards either front or back. The hardware cloth, perforated metal, and slat floors have the advantage that the hutch floors are self-cleaning. The perforated metal floor provides maximum com-

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Figure 15.—**All-metal hutches at the United States Rabbit Experiment Station. Feeding, watering, and cleaning are facilitated by using hutches of this type. (See also fig. 11.)**

fort for the rabbits and permits effective treatment with fumigants and disinfectants but may collect moisture in a persistently foggy climate.

ALL-METAL HUTCHES

Domestic rabbits often become restless and gnaw exposed surfaces of wood or other readily destructible material within the hutch. In such cases repairs are needed more or less continuously, the hutch looks unattractive, and sometimes unsanitary conditions develop.

The use of metal exclusively in hutch construction seemed impracticable until recently because of the large investment required. Now, however, electro spot-welded wire fabric (called muskrat fence) provides a suitable and relatively inexpensive material. Several

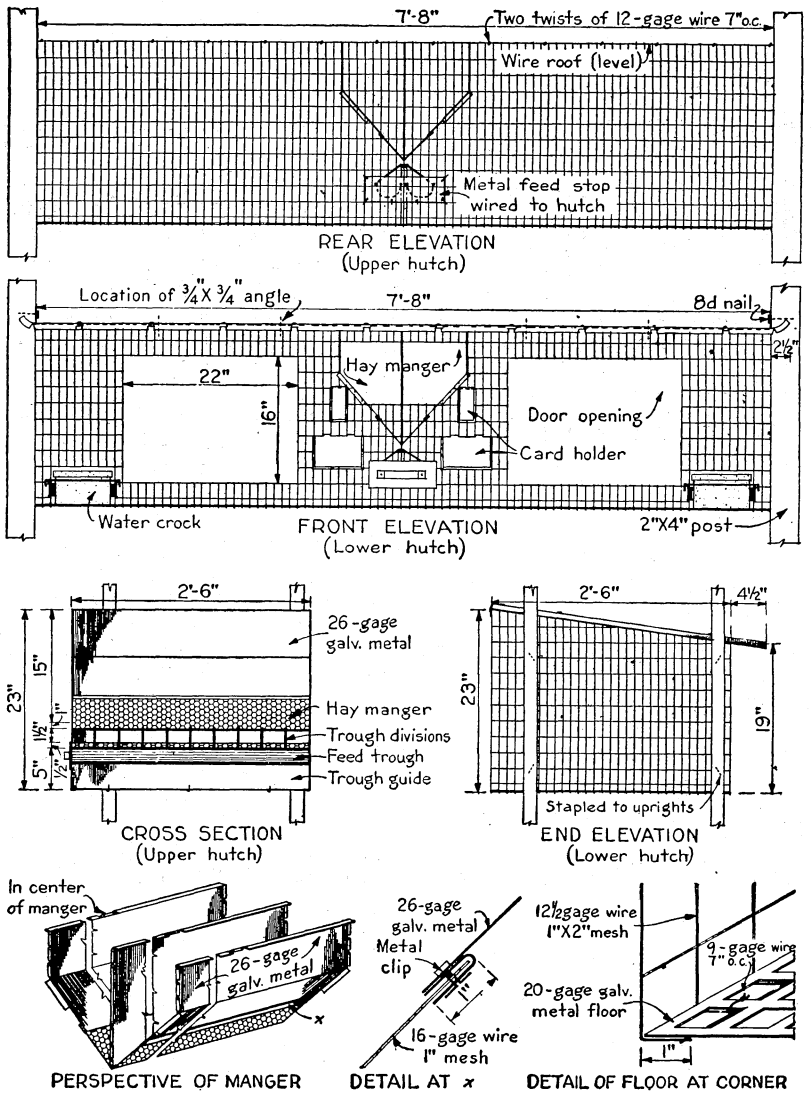


***Figure 16.*—Construction details for all-metal rabbit hutch. (Prepared by the Division of Farm Buildings and Rural Housing, Bureau of Plant Industry, Soils, and Agricultural Engineering.)**

types of rabbit hutch constructed of this fabric are manufactured and sold, and the Rabbit Experiment Station has designed all-steel hutches that can be economically constructed of stock materials by anyone with mechanical ability (fig. 15). The station does not sell hutches.

Convenient, two-compartment hutches, as illustrated in figures 16 and 17, can be made for the most part of electro spot-welded wire fabric, 1- by 2-inch mesh. In 24-inch widths this material can be used for the sides and ends. Labor can be saved by using one length

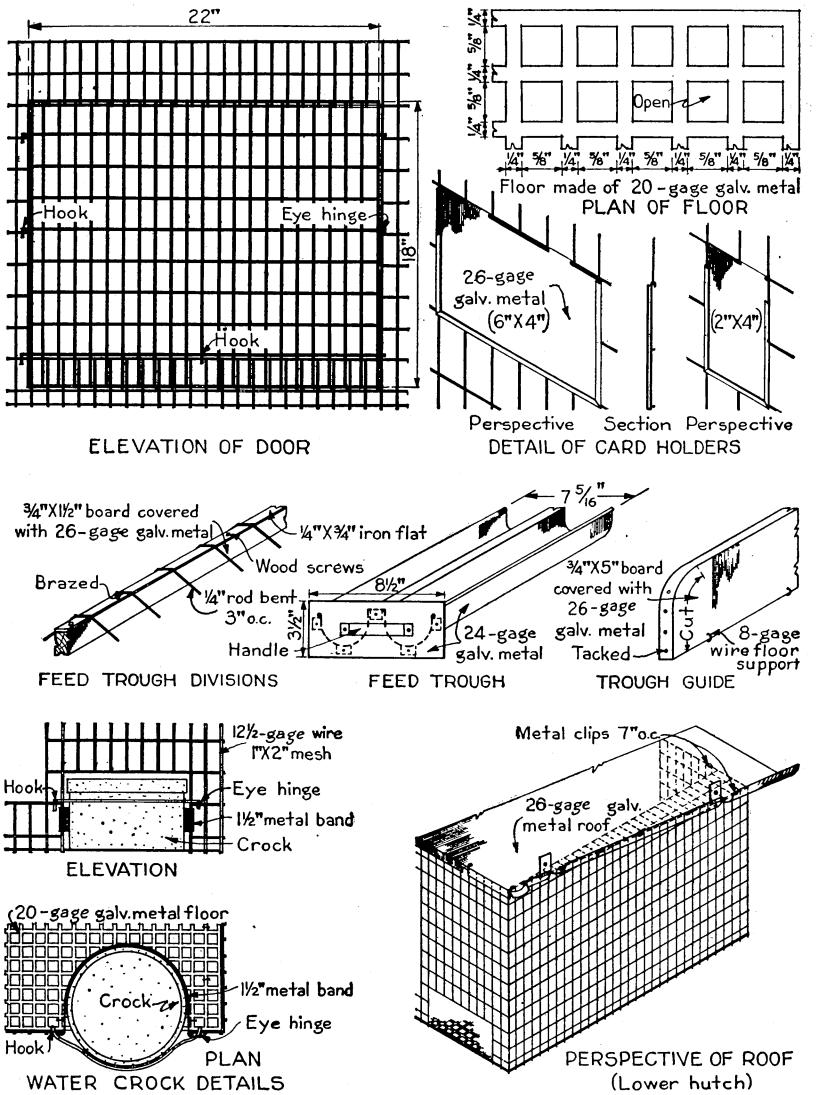


Figure 17.—**Additional construction details for all-metal rabbit hutch. (Prepared by the Division of Farm Buildings and Rural Housing, Bureau of Plant Industry, Soils, and Agricultural Engineering.)**

of the wire fabric for all sides, bending it at the corners; but if separate pieces are cut for front, back, and sides, these can be fastened together at the corners with spiral wire or a soft galvanized stovepipe wire of about 12 gage. In the same way the sides and ends after assembling can be attached to a bottom of either galvanized ⅝-inch-mesh hardware

cloth or perforated metal sheets (p. 34). If a sloping roof is used on the hutch, as is required for lower sections in tier installation, the end sections are bent to the desired pitch, and this also provides additional rigidity. The top can be made of either electro spot-welded wire fabric or galvanized sheet iron. The hay manger between the compartments can be constructed of 1-inch-mesh, 16-gage poultry netting, as shown in figure 16. The electro spot-welded wire fabric can be cut as desired to provide openings for doors and feed trough and permit access to the hay manger. Methods of constructing a wire lock or fastener, hinges, and partitions beneath the hay manger are shown in figure 17.

BILL OF MATERIALS FOR ALL-METAL HUTCH

As shown in figures 16 and 17, two all-metal hutches (one upper and one lower) can be constructed of the following materials:

Wire fabric.—All wire fabric should be electro spot-welded, 12½-gage, 2-inch vertical mesh, and 1-inch horizontal mesh. The following quantities are required:

48 linear feet, 24 inches wide—for walls and four doors.
8 linear feet, 30 inches wide—for top of upper hutch.

Galvanized sheet steel.—Wherever practicable the edges of the galvanized sheet steel used should be turned under ¼ inch for stiffness. The following quantities are required:

1 sheet, 26 gage, 4 by 8 feet, cut into the following pieces:
- 4 pieces, 15 inches by 2 feet 8 inches—for sides of hay manger.
- 2 pieces, 16 inches by 2 feet 8 inches—for center of hay manger.
- 4 pieces, 1½ by 18 inches—for crock straps.
- 4 pieces, 2 inches by 2 feet 6 inches—for manger mesh guard.
- 4 pieces, 7 by 5 inches—for breeding-record cards.
- 4 pieces, 3 by 5 inches—for feed-record cards.
- 2 pieces, 6 inches by 2 feet 6 inches—for feed-trough division.
- 2 pieces, 12 inches by 2 feet 6 inches—for trough guides.

1 sheet, 24 gage, 3 by 3 feet, cut into the following pieces:
- 2 pieces, 4 by 9 inches—for front of feed trough.
- 2 pieces, 1½ by 10½ inches—for feed-trough handles.
- 2 pieces, 1 foot 3 inches by 2 feet 7 inches—for feed trough.

1 sheet, 26 gage, 3 by 8 feet—for roof. (Not cut into pieces.)

4 angles, 20-gage galvanized iron, ¾-inch sides, 31 inches long.
Double each leg—for roof support of lower hutch at spaced intervals. Cut away enough of one side at both ends for the other side of angle to rest on sides of hutch. Riveting angle in place to under side of roof gives added rigidity.

2 sheets, 20 gage, 2 feet 6 inches wide by 7 feet 8 inches long—for floors. Perforate with ⅝-inch square holes ⅞ inch on centers both ways.

Wire:

5 linear feet, 12-gage galvanized soft wire—for lacing.
7 linear feet, 9-gage copper wire—for lacing.
2 linear feet, 8-gage copper wire—for lacing.
4 pieces, 13 inches long, No. 9 soft galvanized wire—for crock hooks.

Miscellaneous:

1 piece, 1-inch-mesh, 16-gage poultry netting 30 by 12 inches—for manger.

Miscellaneous—Continued.

2 pieces strap iron, ¼ by ¾ inch by 30 inches—for feed-trough division.
18 pieces, ¼-inch-diameter, iron rods, 10 inches long—for feed-trough division.
6 round-head wood screws, 5/16 by 1 inch—for feed-trough division.
16 large carpet tacks—for trough guide.
53 brass clips or cotter pins, ⅛ by 5/16 inch, with flat heads (see detail x fig. 16).
4 common eightpenny wire nails.
16 staples, ¾ inch--9 gage—for fastening to support.
2 pieces, wood boards (yellow pine or other kind), ¾ by 1½ inches by 2 feet 6 inches—for feed-trough division.
2 pieces, wood boards (yellow pine or other kind), ¾ by 5 inches by 2 feet 6 inches—for trough guide.
4 earthenware crocks, 7 inches in diameter, 4 inches deep.

WOODEN-FRAME WIRE HUTCHES

Though not so durable as the all-metal hutch, the wooden hutch with woven-wire sides and ends permits good circulation of air and is more sanitary than a solid hutch. It can be constructed, as shown in figures 18 and 19, of the following materials:

BILL OF MATERIALS FOR WOODEN-FRAME WIRE HUTCH

Lumber (all sizes net for S4S material):

2 pieces, 1¾ by 1¾ by 29 inches—for front corner posts. (If legs are desired the pieces should be 60 inches long for a single-deck unit and 76 inches long for a double-deck unit.)
2 pieces, ¾ by 2¾ by 29 inches—for door jambs.
2 pieces, ¾ by 2 by 29 inches—for manger front.
2 pieces, ¾ by 0 by 2 by 7 inches—for triangular manger front.
1 piece, ¾ by 5¾ by 7½ inches—for manger front.
1 piece, ¾ by 2¾ by 7½ inches—for manger front.
2 pieces, 1¾ by 1¾ by 21 inches—for rear corner posts. (If legs are desired, the pieces should be 52 inches long for a single-deck unit and 68 inches long for a double-deck unit.)
1 piece, ¾ by 5¾ by 21 inches—for manger rear.
1 piece, ¾ by 2¾ inches by 7 feet 8 inches—for top front.
1 piece, ¾ by 5¾ inches by 7 feet 8 inches—for top rear.
3 pieces, ¾ by 3¾ inches by 7 feet 8 inches—for bottom.
2 pieces, ¾ by 1¾ by 9¾ by 34 inches—for top ends.
2 pieces, ¾ by 3¾ by 34 inches—for bottom ends.
2 pieces, ¾ by 2¾ by 17 inches—for crock supports.
2 pieces, ¾ by 4¼ by 11¼ by 29¾ inches—for manger top.
1 piece, ¾ by 1¾ by 30½ inches—for manger bottom.
1 piece, ¾ by 4¾ by 30½ inches—for feed-trough track.
4 pieces, ¾ by 1½ by 25 inches—for vertical doors.
4 pieces, ¾ by 1½ by 20 inches—for horizontal doors.
2 pieces, 1 by 1½ by 4 inches—for door-latch blocks.

Galvanized iron:

2 pieces, 24 gage, 1¾ by 30 inches—for feed-trough guards.
1 piece, 26 gage, 36 inches by 8 feet—for roof.

Miscellaneous (continued on p. 39):

1 piece, ⅝-inch-mesh, 17-gage galvanized hardware cloth, 30 inches by 8 feet—for floor.

1 piece, ¾-inch-mesh, 16-gage poultry netting, 24 by 36 inches—for manger.

1 piece, 1-inch-mesh, 18-gage poultry netting, 24 inches by 8 feet—for front and doors.

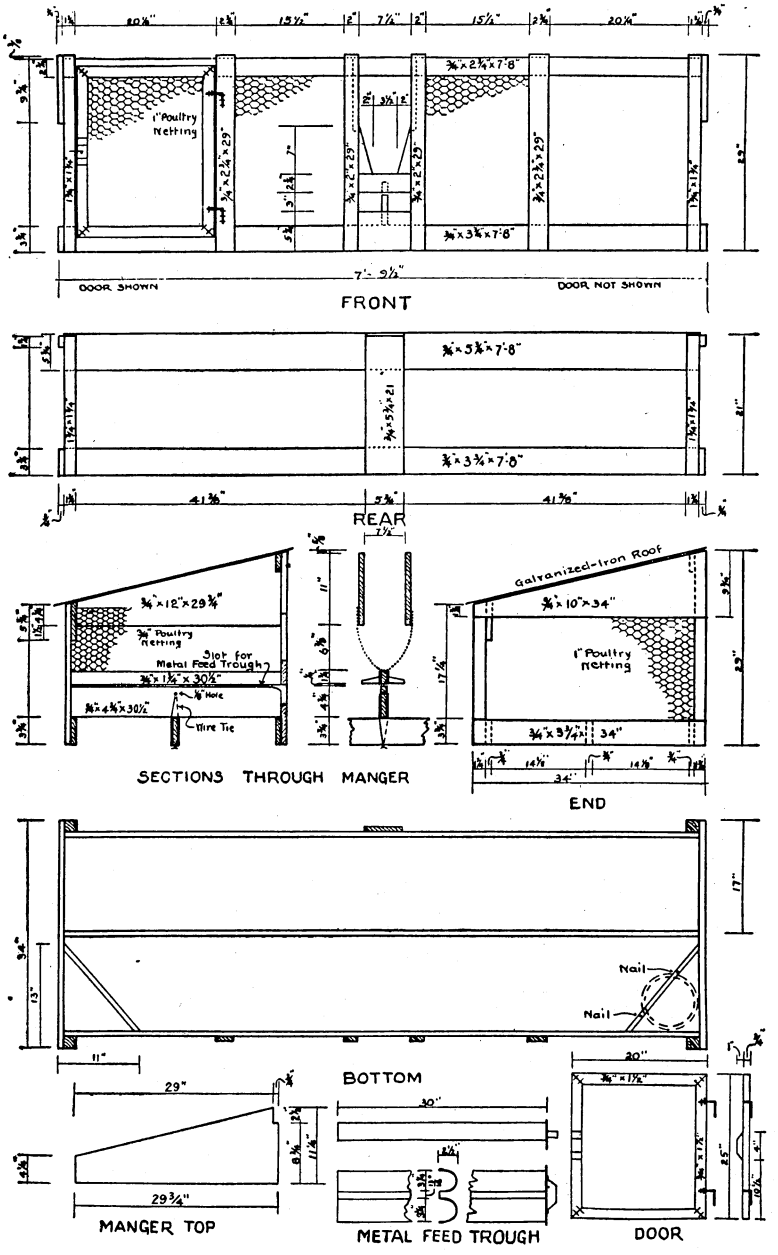


Figure 18.—Construction details for a two-unit wooden-frame wire hutch.

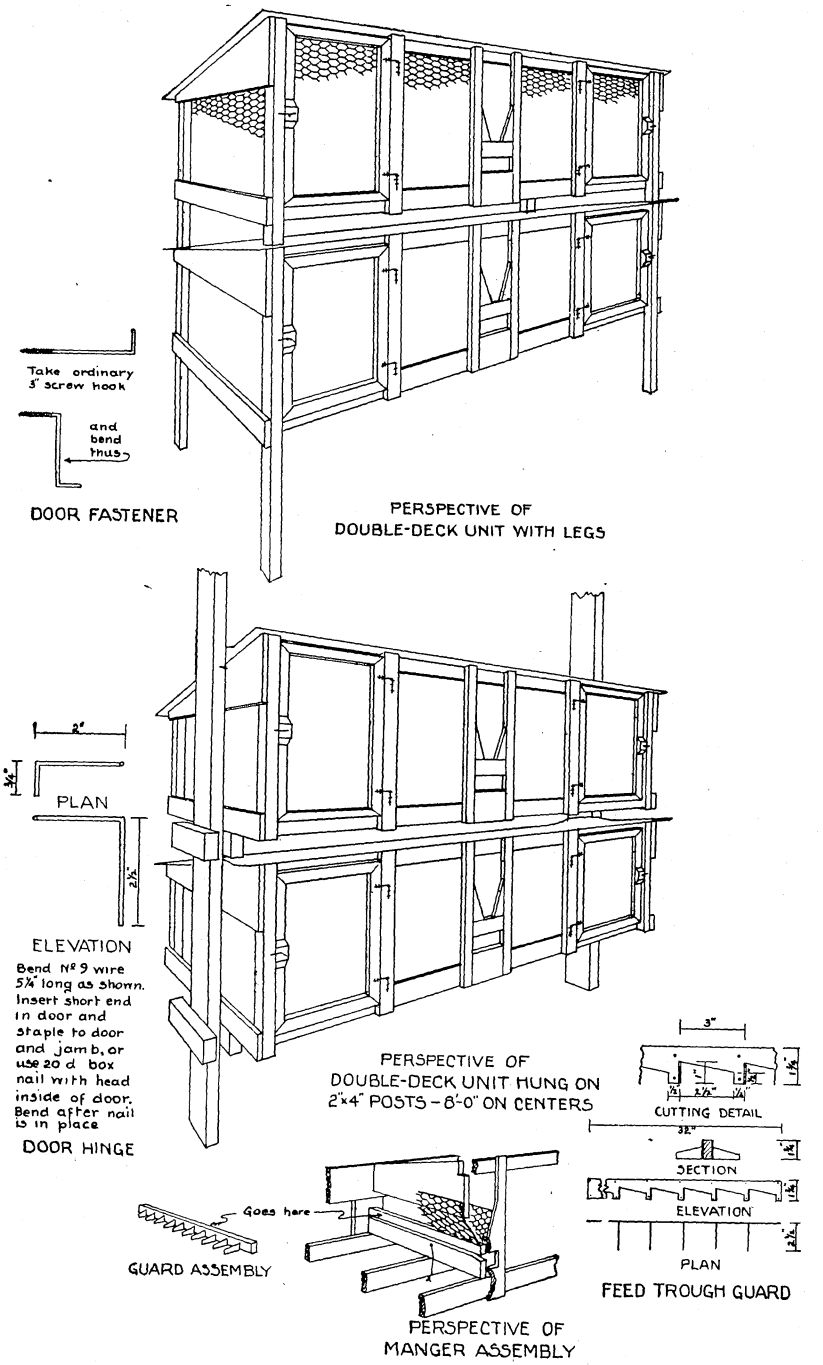
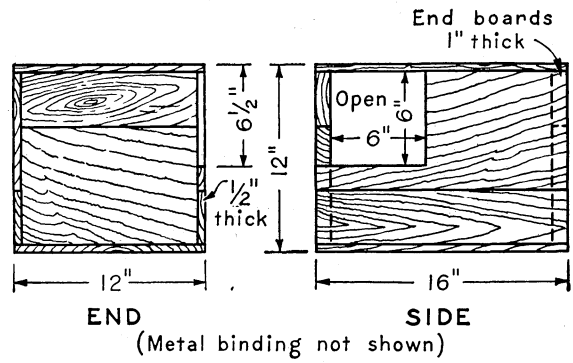


***Figure 19.*—Additional construction details for a two-unit wooden-frame wire hutch, including manner of hanging two tiers of hutches.**

Miscellaneous—Continued from p. 37.

1 piece, 1-inch-mesh, 18-gage poultry netting, 18 inches by 14 feet—for back and ends.
4 hinges.
2 door latches.
Fourpenny box nails—for front, rear, and roof.
Eightpenny box nails—for posts, ends, and bottom.
Poultry-netting staples.

These hutches are designed to fit between 2- by 4-inch supports set flatwise and 8 feet apart from center to center. See figure 29 for general plan of rabbit shelter, with dimensions. If 4- by 4-inch posts are used, as indicated in figure 29, the hutches must be 2 inches shorter or the post spacing 2 inches wider.



HAY MANGERS AND FEED TROUGHS

Hay mangers and feed troughs are an important part of the hutch equipment. They should have a capacity large enough to prevent waste of feed and save time in feeding operations. A convenient type of hay manger with a trough that prevents waste of hay is shown in figures 16 and 19. Feed troughs (see figs. 17 and 18) should be constructed of galvanized iron and should be removable, so as to be readily cleaned and disinfected. Feed guards should be placed on feed troughs at 3-inch intervals to prevent young rabbits from gaining access to the trough and contaminating the feed with their feet. Feed guards also aid materially in preventing the rabbits from scratching out and wasting the feed.

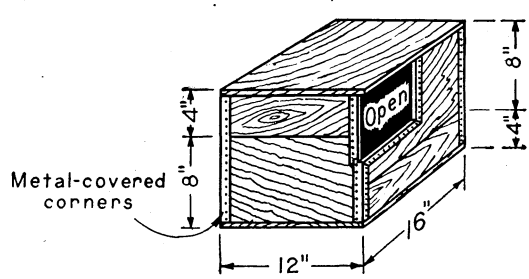


***Figure 20.*—Construction details for nest box.**

NEST BOXES

Nest boxes should be large enough to prevent crowding but small enough to keep the occupants warm by their own body heat. Two general kinds of boxes are used extensively—the box type (fig. 20) and the nail-keg nest box (fig. 21).

The box type is constructed so the top and bottom can be removed to facilitate cleaning. The nail-keg nest box is inexpensive and easy to construct. A nail keg with metal end hoops is best for the purpose.

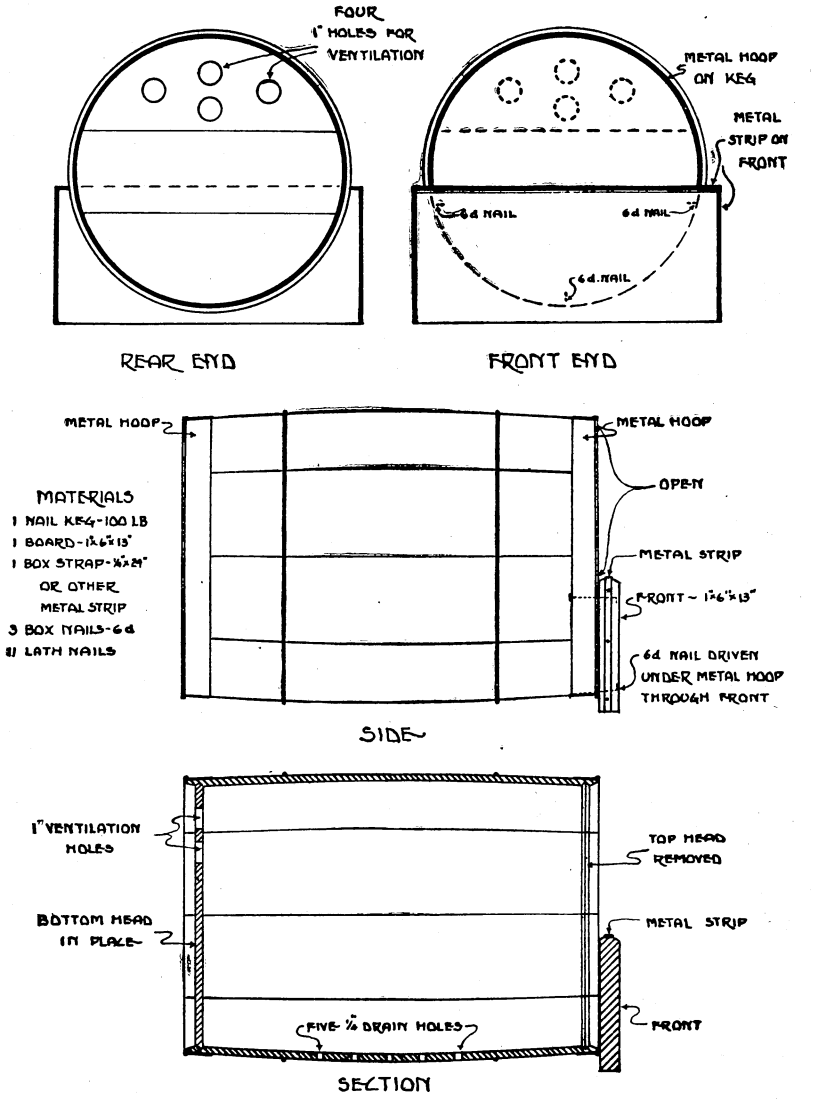


Figure 21.—**Construction details for nail-keg nest box.**

One with a head diameter of 13 inches is preferable for does weighing more than 12 pounds; a diameter of 11½ inches for those weighing 8 to 12 pounds; and a diameter of 10 inches for those weighing less than 8 pounds.

SELF-FEEDERS

PRECAUTIONS

The self-feeding system is primarily adapted to raising rabbits for market. It is not recommended for feeding dry does or herd bucks, or for developing breeding stock. The full feeding of these classes of rabbits would result in their attaining a higher degree of condition than is desirable for breeding.

The does should be carefully watched the first few days after kindling. If the size of the litter is materially reduced for any reason, or if the doe produces more milk than the young will consume, it may be necessary to adjust the size of the litter by transferring young from another litter or to restrict the doe's ration for a few days to check the heavy milk secretion and avoid udder complications that might follow.

The self-feeder is not adapted for use with a mixed ration that can be separated by the rabbits, as the animals in their search for the more palatable kinds of feed will scratch out and waste considerable of the ration. On the other hand, when the different grains and protein supplements are placed in separate compartments, so that the rabbits have free access to any kind of feed at all times, they will consume the particular feed they desire and the quantity wasted will be negligible.

ADVANTAGES

The advantages of the self-feeding system are:

1. It has proved satisfactory in developing fryers and roasters for market.
2. It prevents waste and contamination and requires less feed than the hand-feeding system to produce a unit of gain in live weight.
3. It saves much labor and makes possible a consistently high-quality market product.
4. It prevents inefficiency and carelessness in feeding during the finishing period.
5. Self-fed rabbits gain more rapidly in weight than hand-fed rabbits.
6. Self-fed rabbits attain a high degree of finish—fryers give a carcass yield of 50 to 57 percent of their live weight and roasters 60 to 65 percent.

KINDS OF SELF-FEEDERS

Two general kinds of self-feeders are illustrated—the all-metal (figs. 22, 23, and 24) and the 5-gallon, oil-can feeders (figs. 25 and 26) of such capacity that when filled about twice a week they will furnish a doe and her litter with all the concentrates required. The angles of the sides and the size of the throat should be as indicated in the drawings; otherwise, the feed may move too freely and be wasted, or it may choke the hoppers and become unavailable.

The all-metal self-feeder is designed especially for experimental work where it is necessary to keep accurate records. It has the added

advantage of not requiring floor space and can be constructed by a tinsmith. Figures 22, 23, and 24 show the materials required and the method of construction and attachment.

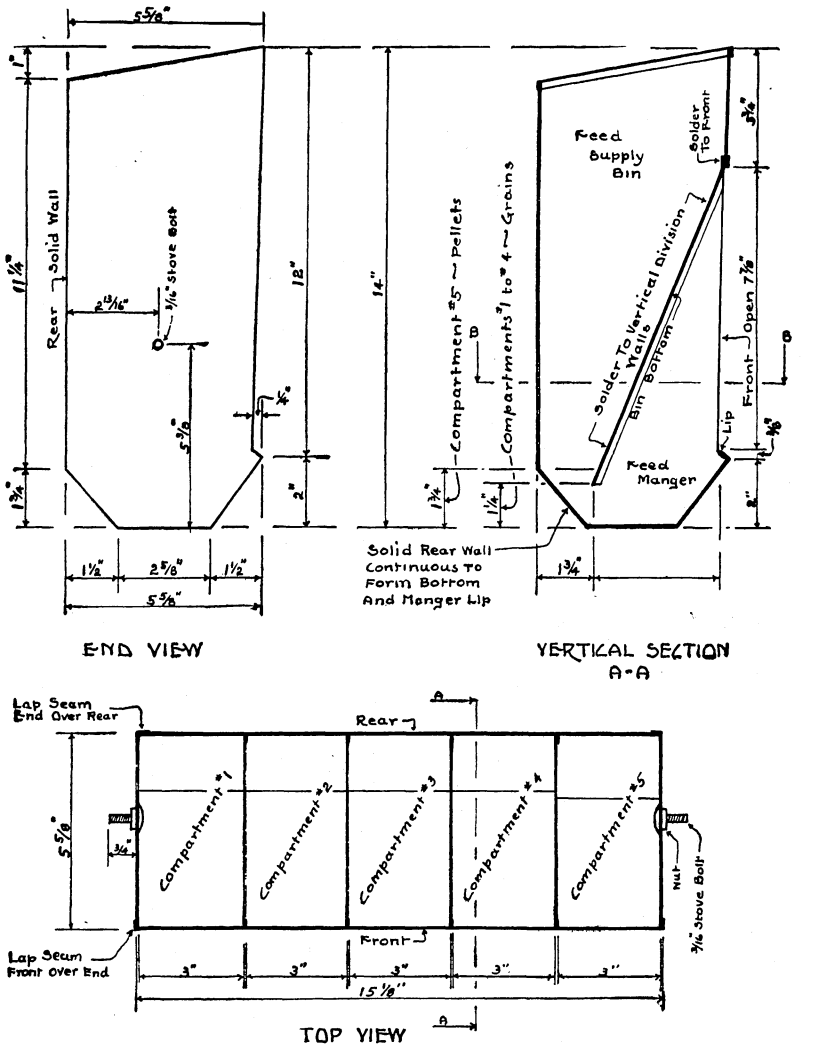


***Figure 22.*—Construction details for an all-metal rabbit self-feeder. End, vertical, and top views.**

The oil-can feeder is less expensive, can be made by anyone with mechanical ability, and is satisfactory for use in commercial rabbitries. Two types are illustrated in figures 25 and 26. One (fig. 25) is constructed from a 5-gallon oil can; the side of an apple box, ⅜-inch plywood, or other wood material of similar thickness; two strips of 26-gage

galvanized iron, 30 inches long; and one piece of 26-gage galvanized iron 11½ inches square. The other type (fig. 26) is similar but lacks the galvanized iron parts used in type 1. The first is more easily con-

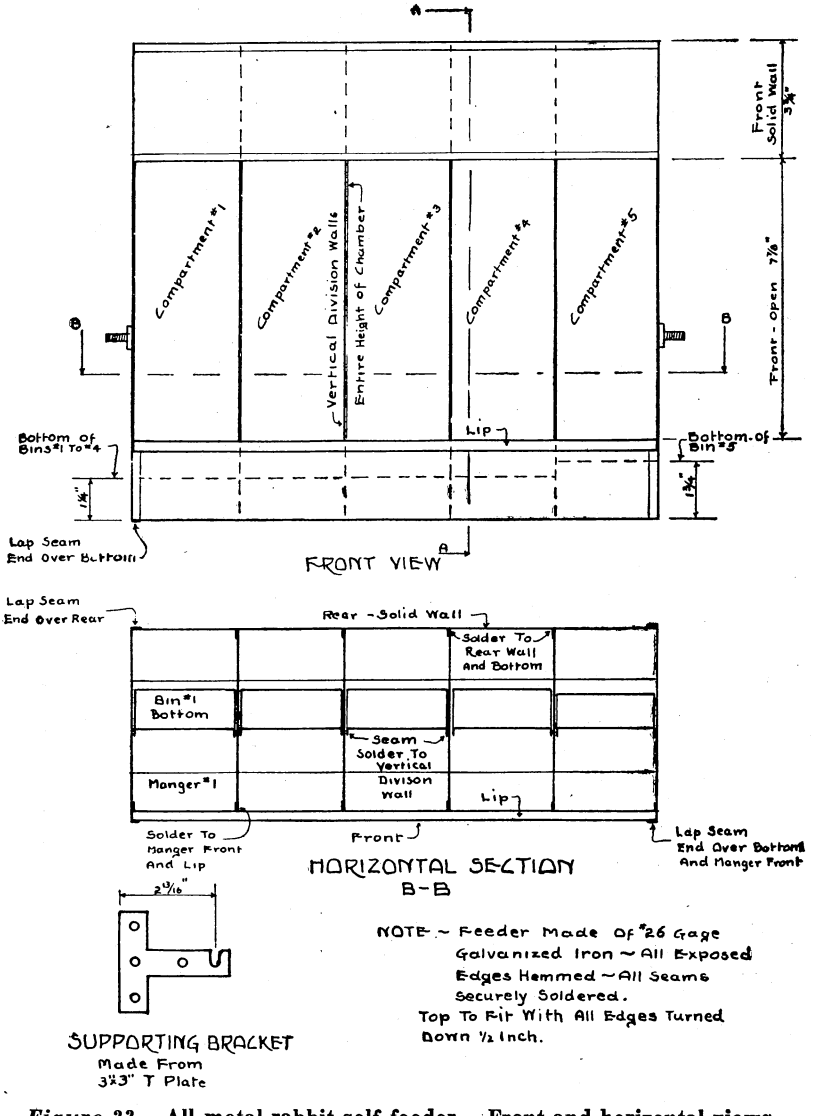


***Figure 23.*—All-metal rabbit self-feeder. Front and horizontal views.**

structed but the second is less expensive. In making either, it will be desirable to check the outside measurements of the oil can used; the detailed suggestions made are for a can 9⅝ inches wide by 13¾ inches high.

DIRECTIONS FOR MAKING OIL-CAN SELF-FEEDER

Type 1.—Cut the top out of a 5-gallon oil can and clean the can thoroughly. Cut two openings in both front and rear (see "front-rear," fig. 25). These should each be 4 inches from the bottom and, when finished, should be 4 inches high by

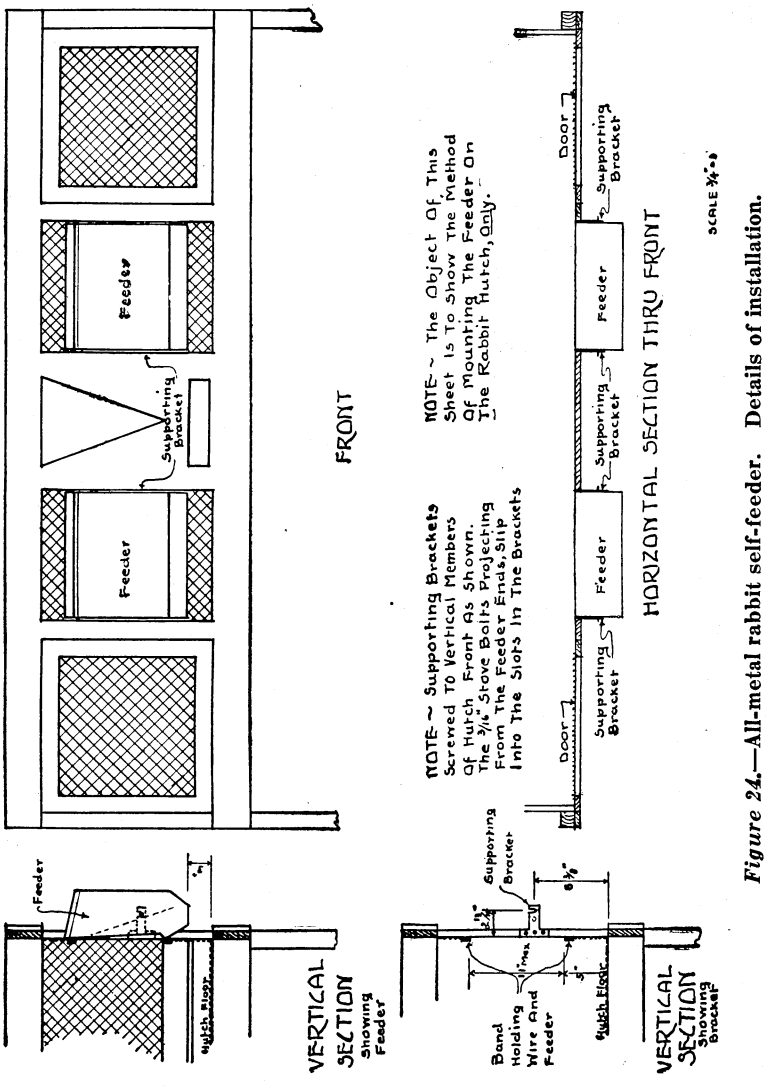


Figure 24.—All-metal rabbit self-feeder. Details of installation.

3 inches wide. The openings, as cut, should be smaller than when finished to allow for a ¼-inch hem to be turned on the inside of the can to make a smooth edge. (See "front-rear" and "cut openings in can," fig. 25.)

Use a side of an apple box or ⅜-inch plywood, or other wood material of the same thickness, for the partitions (*S* and *T*). Make one main partition (*S*) and two side partitions (*T*).

Cut two bin bottoms (*U*) out of 26-gage galvanized iron. The strips should each be 30 inches long and 4 7/16 inches wide. An opening 7⅛ inches long and 3 7/16 inches wide should be centered 15 inches from one end of the strip and ½ inch from each side.

The two top outside corners of each strip (*U*) should be cut out ¾ inch by 1 3/16 inch and the projecting shoulder rounded off 1½ inches to permit the strips (*U*) to fit snugly into the rounded corner of the can.

In assembling the self-feeder three threepenny fine nails should be equally spaced on the center line of the main partition (*S*) and driven through it, after which it is turned over and placed on one of the side partitions (*T*) that is standing on edge. The partition (*T*) is then securely fastened to the median line of *S* by three more nails. The other side partition (*T*) is then fastened to *S* by driving it down on the three protruding nails.

Fasten a ⅛-inch tin strip across the top edge of the two partitions (*T*) (see "top," fig. 25) to prevent spreading. The assembled pieces *S* and *T* should be placed on a flat surface, top down, and the bin bottoms (*U*) centered on the bottom of side partition (*T*), being sure that the rounded corners are opposite the main partition (*S*). Secure one bin bottom (*U*) to one partition (*T*) with two threepenny fine nails; then center and fasten the other bin bottom (*U*) to the opposite side partition (*T*) in like manner.

The assembled parts, (*S*, *T*, and *U*) (see "assembly," fig. 25) are now ready to be placed in the 5-gallon can and are fastened to the can with threepenny fine nails, as shown on the "front-rear" and "two sides" drawings. Bend and crimp top of *U* over edge of can to secure bin bottoms. Tack the can to the bottom of *S* and *T* to prevent sagging.

A piece of 26-gage galvanized iron 11½ inches square should have the corners cut and 1 inch turned down on each side to form a cover. (See "side view-cover," fig. 25.)

Type 2.—Cut the top out of a 5-gallon oil can and clean the can thoroughly. Cut two openings in both front and rear of the can. (See "front-rear" in drawing, fig. 26.) These should each be 4 inches from the bottom and, when finished, should be 4 inches high and 3 inches wide. The openings, as cut, should be smaller than the finished openings to allow for a ¼-inch hem to be turned on the inside of the can to make a smooth edge. (See drawing of cut and finished openings, fig. 26.)

Use a side of an apple box or ⅜-inch plywood, or other wood material of the same thickness, for parts *X*, *Y*, and *Z*. Make one main partition (*X*), two side partitions (*Y*), and two bin bottoms (*Z*). Cut two slots in main partition (*X*) to receive the two bin bottoms (*Z*), and fasten the two side partitions (*Y*) one on each side of *X* on the vertical center to form four compartments.

In assembling *X*, *Y*, and *Z* three threepenny fine nails should be equally spaced on the center line of the main partition (*X*) and driven through it, after which it is turned over and placed on one of the side partitions (*Y*) that is standing on edge. The partition (*Y*) is then securely fastened to the median line of *X* by three more nails. The other side partition (*Y*) is then fastened to *X* by driving it down on the three protruding nails.

Fasten a ⅛-inch tin strip across the top edge of the two partitions (*Y*) (see "top," fig. 26) to prevent spreading.

Center the two bin bottoms (*Z*) in the slots in *X* and secure with threepenny fine nails.

The assembled parts (*X*, *Y*, and *Z*) (see "assembly" fig. 26) are now ready to be placed in the can and are secured to it with threepenny fine nails, as shown on the "front-rear" and "two sides" drawings (fig. 26). Tack the can to the bottom of *X* and *Y* to prevent sagging.

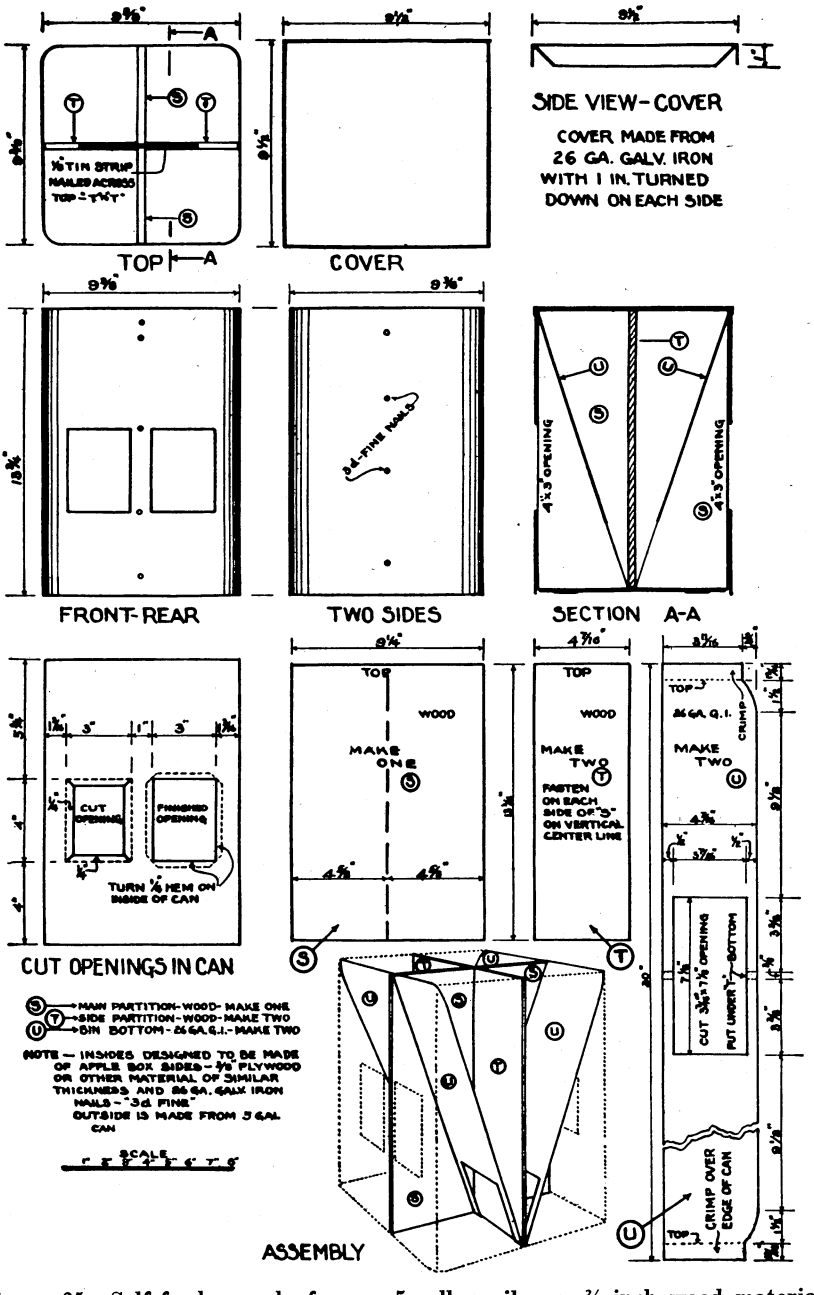


Figure 25.—Self-feeder made from a 5-gallon oil can, ⅜-inch wood material, and galvanized iron.

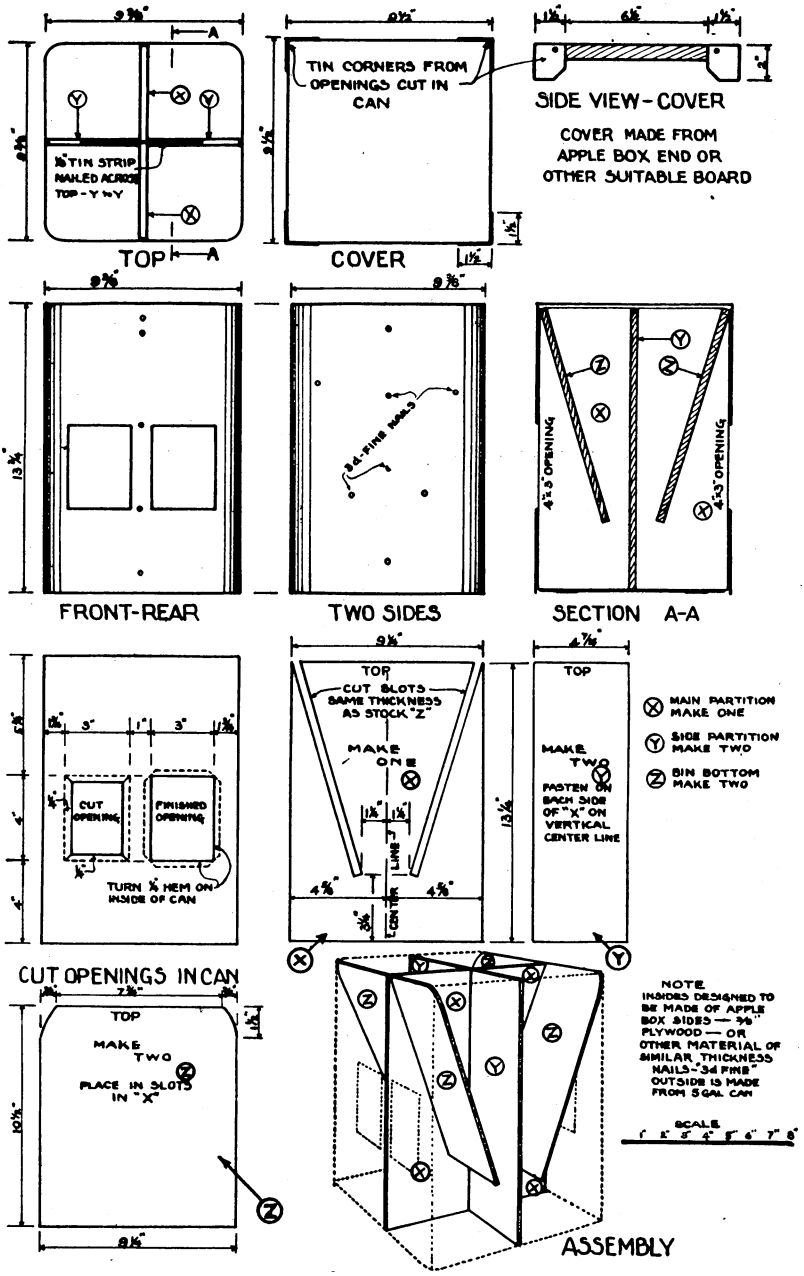


Figure 26.—Self-feeder shown in figure 25 made with wood instead of galvanized iron.

The cover, 9½ inches square, is made from an end board of an apple box. Four tins, each 2 by 3 inches, for securing the corners are made from openings cut in the can. (See "side view-cover," fig. 26.)

SHELTERS

Rabbit shelters, or houses, accommodating 50 to 100 hutches are preferable to larger ones, for in smaller groups rabbits are less likely to contract disease and outbreaks are more readily controlled.

BILL OF MATERIALS FOR RABBIT HOUSE

The rabbit house shown in figure 27 can be constructed of the following materials:

⅓ cubic yard of concrete—for post footings.
8 posts, 2 by 4 inches by 9 feet.
9 posts, 2 by 4 inches by 8 feet.
18 plates and girts, 2 by 4 inches by 8 feet.
6 end girts, 2 by 4 inches by 10 feet.
13 rafters, 2 by 4 inches by 10 feet.
14 braces, 1 by 6 inches by 3 feet.
60 pieces, 1 by 6 inches by 8 feet tongue-and-groove sheathing—for rear.
40 pieces, 1 by 6 inches by 9 feet tongue-and-groove sheathing—for ends.
2 rear facias, 1 by 8 inches by 12 feet.
280 board feet roof sheathing.
70 linear feet 1- by 1-inch material—for under edge of roof.
260 square feet of prepared roofing.
6 pairs 6-inch T hinges

For open-front shelter add the following:

6 braces, 2 by 4 inches by 3 feet.
2 facias, 1 by 8 inches by 12 feet.
14 post casings, 1 by 4 inches by 9 feet.

For closed shelter add the following:

2 posts, 2 by 4 inches by 9 feet.
7 girts, 2 by 4 inches by 8 feet.
20 pieces, 1 by 6 inches by 10 feet tongue-and-groove sheathing.
32 pieces, 1 by 6 inches by 5 feet tongue-and-groove sheathing.
6 braces, 1 by 6 inches by 3 feet.
2 pairs 6-inch T hinges.

The rabbit shelter for which construction details are shown in figures 28 and 29 (see also fig. 18) has the distinct advantage that additional sections can be added as needed. A concrete floor can be provided with gutters so situated that it can be readily washed clean. Where a corrugated-metal roof makes the shelter too hot, composition shingles or rolled roofing may be laid over solid sheathing, the 2-by-4 rafters in such cases being placed at 2-foot intervals, center to center,

to support the sheathing. Enclosing three sides or making other adaptations for climatic conditions may also be necessary. Material needed for the shelter are listed on page 51.

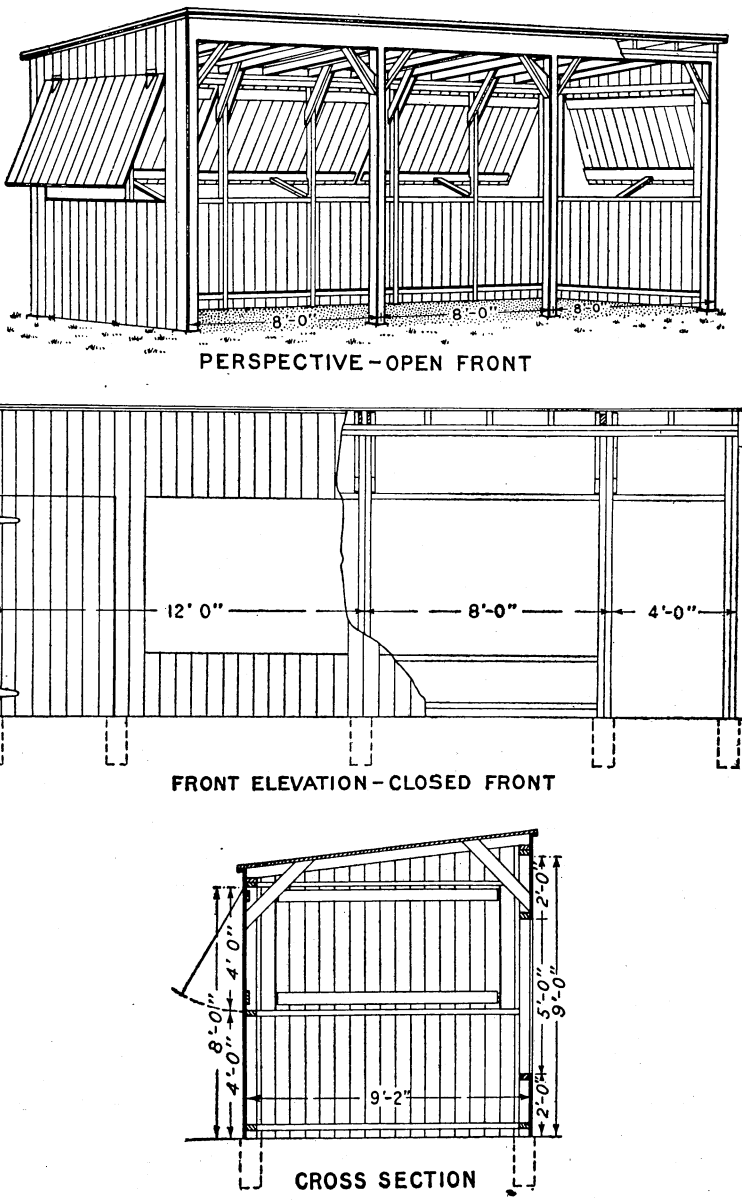
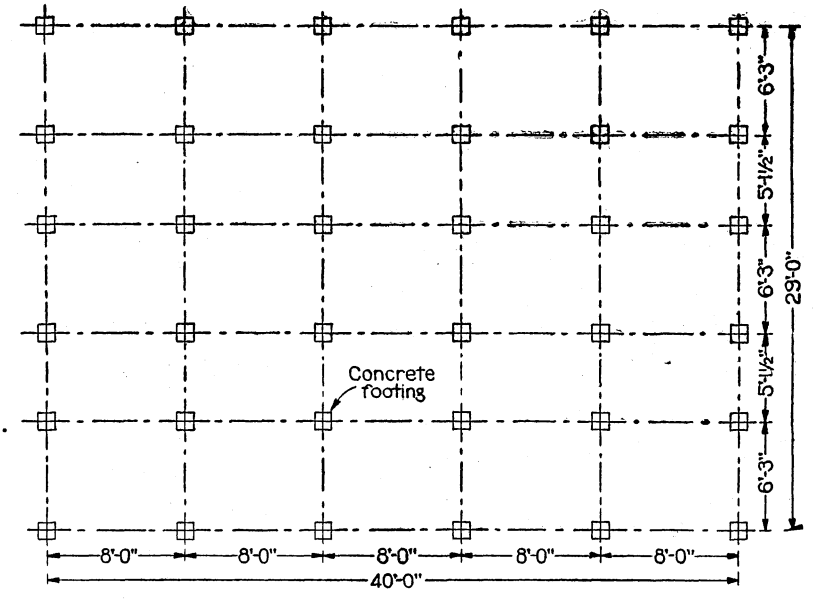


Figure 27.—**Construction details for rabbit house.**

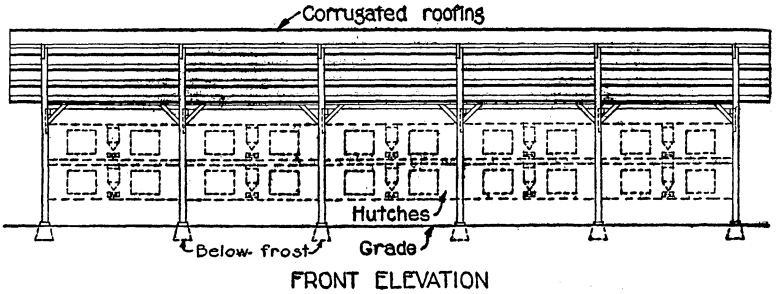
BILL OF MATERIALS FOR RABBIT-HUTCH SHELTER

The following materials will be needed for the rabbit-hutch shelter shown in figures 28 and 29 (continued on p. 53):

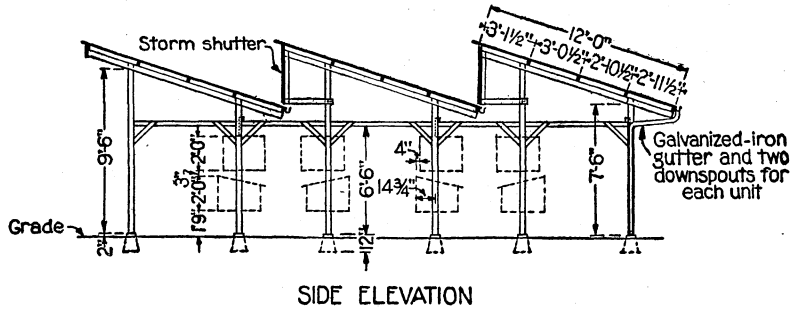
5 sacks of cement, ⅜ cubic yard of sand, and ¾ cubic yard of gravel for 0.8 cubic yard of concrete for post footings. (Use 1 part portland cement to 2 parts of sand and 4 parts of gravel. In localities where frost action is a consideration the footings should be placed below the frost line and be 8 by 8 inches in cross section. If the footings are 8 by 8 inches by 2 feet 8 inches the following materials will be needed: 10 sacks of cement, ¾ cubic yard of sand, and 1½ cubic yards of gravel. Precast footings cost less than those cast in place.)
36 strap irons, ¼ by 1½ by 16 inches, one end drilled for two ⅜-inch lag screws.
72 lag screws, ⅜ by 4 inches.
18 posts, 4 by 4 inches by 10 feet.
18 posts, 4 by 4 inches by 8 feet.
3 cross ties, 2 by 4 inches by 14 feet.
12 cross ties, 2 by 4 inches by 12 feet.
7 longitudinal ties, 2 by 4 inches by 16 feet.
1 longitudinal tie, 2 by 4 inches by 8 feet.
90 knee braces, 2 by 4 inches by 2 feet.
18 purlins, 2 by 4 inches by 12 feet.
26 rafters, 2 by 4 inches by 16 feet.
13 rafters, 2 by 4 inches by 8 feet.
5 facias, 2 by 6 inches by 16 feet.
2 facias, 1 by 8 inches by 16 feet.
1 facia, 1 by 8 inches by 8 feet.
8 facias, 1 by 5 inches by 3 feet.
4 facias, 1 by 6 inches by 3 feet.
12 struts, 2 by 4 inches by 2 feet 6 inches.
20 hangers, 1 by 4 inches by 2 feet 9 inches.
24 hangers, 1 by 4 inches by 3 feet 3 inches.
7 blocks, 1 by 4 inches by 12 feet.
30 pieces, 1 by 5 inches by 8 feet—for shelter frame.
12 oak pins (1 inch), 7 inches long.
1 piece, 1 by 2 inches by 10 feet—for buttons.
50 hinges, 3 by 3 inches, with screws.
20 round-head screws, 2½ inches long with washers—for holding buttons.
10 eyebolts, ⅜ by 1½ inches, 1-inch eye and nut.
10 screw eyes (1-inch eye) or heavy staples.
10 swivel pulleys for ¼-inch rope.
10 cleats (4 inches) for ¼-inch rope, with screws.
90 linear feet ¼-inch sash cord.
120 linear feet 4-inch gutter with hangers.
38 linear feet 3-inch downspout.
6 turn-outs for 3-inch downspout.
12 bends (90°) for 3-inch downspout. (All gutters and spouts to be of 26-gage galvanized metal.)
40 pieces corrugated roofing 3 feet long, 26 inches wide—for shutters. (Plain galvanized metal, weather-resistant wall board, or ⅜-inch tongue-and-groove ceiling could be used in place of corrugated metal.)
66 pieces corrugated roofing, 7 feet long, 26 inches wide.



FOUNDATION PLAN



FRONT ELEVATION



SIDE ELEVATION

Figure 28.—**Construction details for rabbit-hutch shelter. (Prepared by the Division of Farm Buildings, and Rural Housing, Bureau of Plant Industry, Soils, and Agricultural Engineering.)**

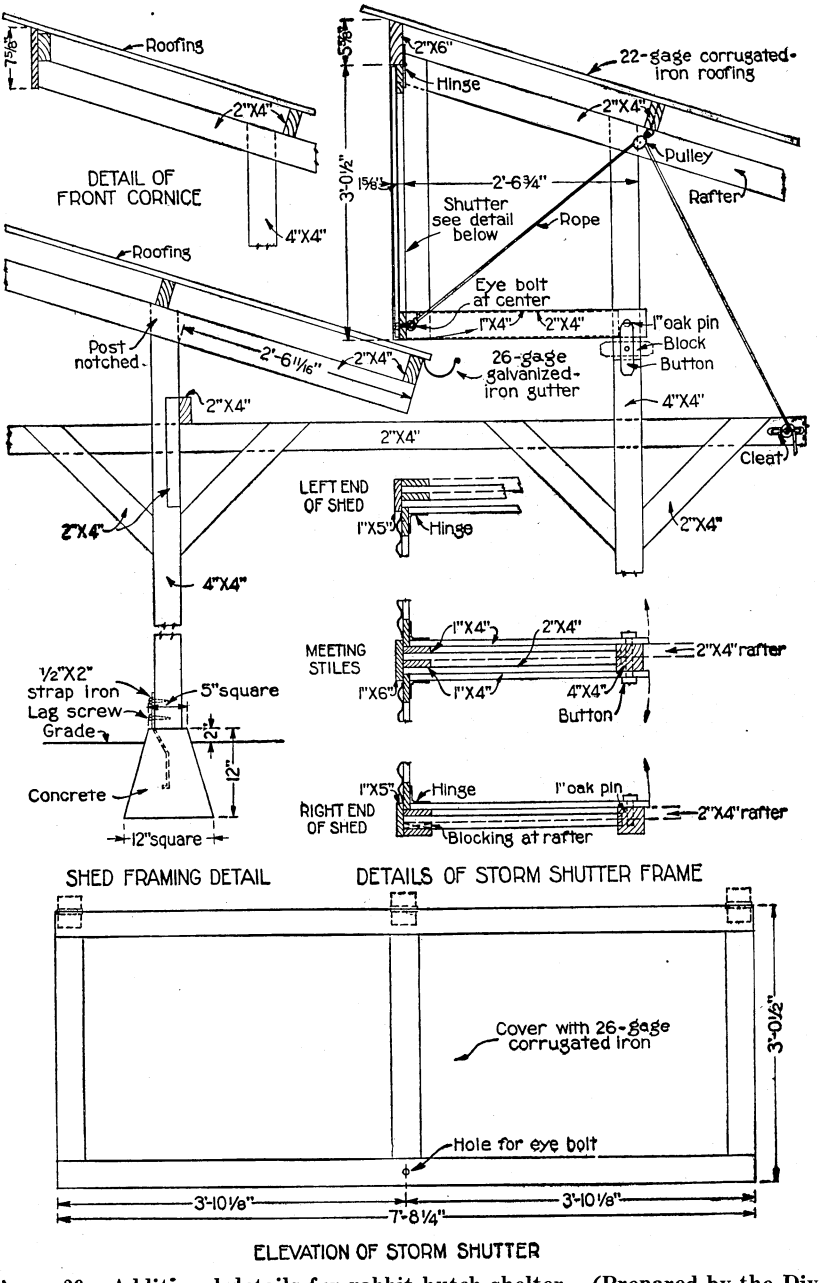


Figure 29.—**Additional details for rabbit-hutch shelter. (Prepared by the Division of Farm Buildings and Rural Housing, Bureau of Plant Industry, Soils, and Agricultural Engineering.)**

66 pieces corrugated roofing, 6 feet long, 26 inches wide. (Roofing to be 24-gage, 2½-inch corrugations, and heavily galvanized; nails for securing roofing should be rust-resistant, providing security against leaks.)
18 pounds sixteenpenny common nails.
2 pounds eightpenny common nails.
1 pound eightpenny finishing nails.
5 pounds tenpenny common nails.
10 gallons of paint for woodwork (three coats).

PREPARING PRODUCTS FOR MARKET

CRATING AND SHIPPING LIVE RABBITS

Rabbits in good condition, properly crated and provided with food and water, can be shipped almost any distance with safety, but it is best not to ship them in extremely hot or cold weather. Crates should always be comfortable, well ventilated, and furnished with bedding of straw or leaves, not sawdust. Only one animal should be placed in one compartment of a shipping crate. Animals to be in transit for 24 hours or less need no more attention than that required to supply a small quantity of feed and water at the beginning of the journey, but if the trip is long and the shipment large, greater supplies of feed and water will, of course, be needed and it may be necessary to send along a caretaker. Plenty of fresh water and hay should be accessible to the rabbits at all times. The same kinds of feed that they have been accustomed to eating in the rabbitry should be given them in transit.

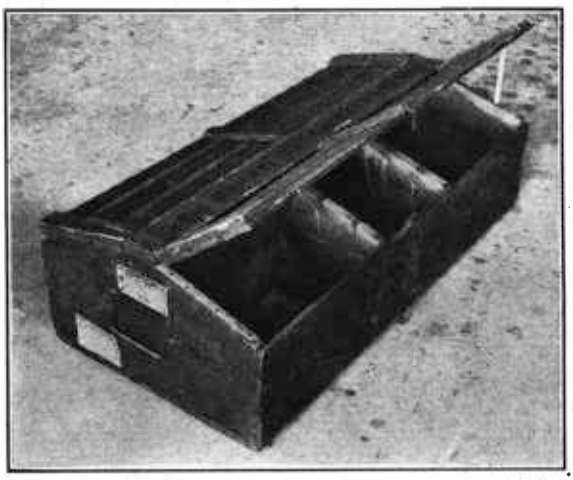


Figure 30.—**Crate for shipping live rabbits.**

Although shipping crates can be made from packing boxes, it is not only good business but effective advertising to ship the rabbits in durable crates that are neatly built, light in weight, and attractive (fig. 30). The shipper should furnish ample space in each compartment and see to it that wire netting effectively prevents the rabbits from gnawing the wood.

When rabbits are shipped by express, a bag of feed and a printed request to feed and water the animals once daily should be attached to each crate. Advice should be given against exposing the animals

to sun or rain and also against placing the crates near steam pipes. The purchaser should be notified when the rabbits were shipped.

SLAUGHTERING AND SKINNING

In slaughtering a rabbit, the neck is usually dislocated by holding the animal by its hind legs with the left hand and placing the thumb of the right hand on the neck just back of the ears, with the four fingers extended under the chin (fig. 31). Pushing down on the neck with the right hand, stretching the animal, pressing down with the thumb, and raising its head by a quick movement dislocates the neck, renders the animal unconscious, and prevents struggling. The carcass is then suspended on a hook inserted between the tendon and the bone of the right hind leg just above the hock. The head is removed immediately to permit thorough bleeding so the meat will have a good color. The tail is removed; the free rear leg is removed at the hock joint, and the front feet are cut off; the skin is then cut just below the hock of the suspended leg and opened on the inside of the leg to the root of the tail and the incision continued to the hock of the left leg. The edges of the skin are carefully separated from the carcass, particular effort being made to leave all fat on the carcass as the skin is pulled down over the animal. This not only makes a more attractive meat product but facilitates drying the skin and prevents "fat burns" on the pelt in drying (fig. 32).

Figure 31.—**Method of holding rabbit for dislocating neck in slaughtering.**

When a skin is left entire it is known as a cased skin. Even small cuts lessen the value of the skin. As soon as the skin is removed, it should be placed on a stretcher, secured, and hung up for drying.

After the carcass has been skinned, a slit is made along the median line of the belly, and the entrails are removed, the liver being left in place. The right hind foot is removed by severing at the hock. Particular care should be taken in dressing rabbits not to get hairs on the carcass; they are difficult to remove and give it an unattractive

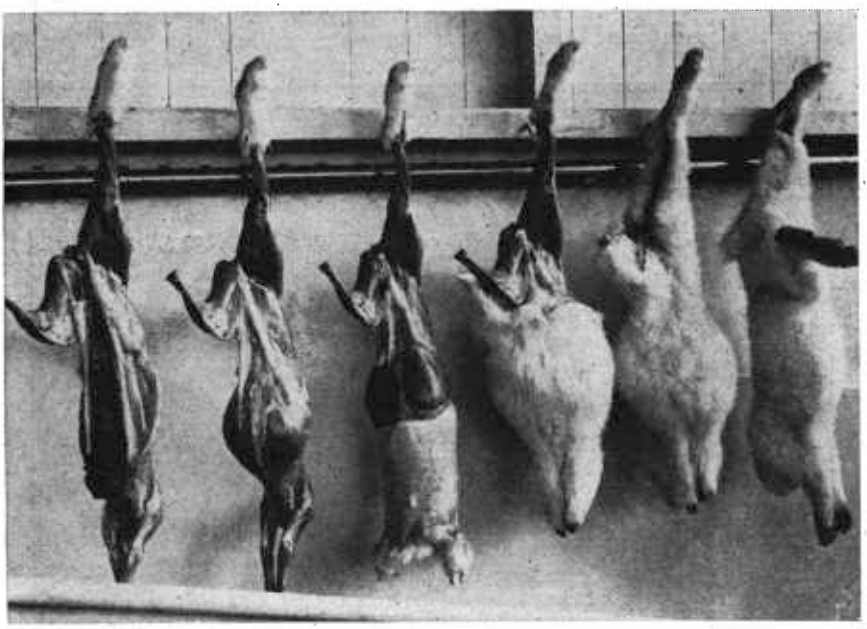


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Figure 32.—**Steps (right to left) in skinning rabbits and removing internal organs. Small jets of water from pipe beneath rack wash blood from back panel and trough.**

appearance. Rinsing the carcass in cold water facilitates removal of hair and blood and also cleanses the carcass. It is not a good practice to leave the carcass in water more than 15 minutes; prolonged soaking causes it to absorb water, and the resulting presence of water in the meat is considered an adulteration of the product.

RABBIT MEAT

Domestic rabbit meat should not be offered for sale in the same manner as wild rabbit. A neatly dressed rabbit, skinned, with the head and feet removed, is much more attractive in the meat market and impresses the prospective purchaser as likely to be more palatable than a rabbit partly dressed with fur on. The heart, liver, and kidneys, especially the liver, are palatable and should not be con-

sidered as waste, for they add to the nutritional value of the product as a whole. It would be to the advantage of rabbit breeders to insist that, when offered for sale by butchers, rabbit carcasses, whether fryers or roasters, be neatly arranged on trays in the refrigerated display cases. Sprigs of parsley around the carcasses will make the display more attractive.

The fryer rabbit will present an attractive appearance in the market if the carcass is cut up, ready for the frying pan, into seven pieces and the liver (fig. 33). A neat, sanitary package for the carcass is a paraffined box with a cellophane window. A box 9 inches

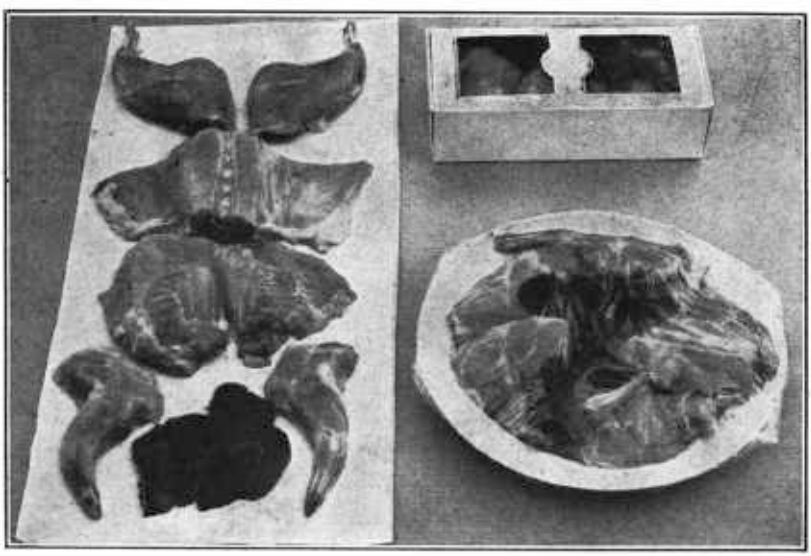

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***Figure 33.*—Method of cutting up fryer rabbit and suitable containers for the carcass.**

long, 4 inches wide, and 2½ inches deep is the correct size for a fryer carcass weighing 1¾ to 2¼ pounds. If the cuts are properly arranged in the carton so that the loin, thighs, and liver are exposed to view and a small piece of parsley placed in the package to add color, it will appeal to the eye of the purchaser (fig. 33). For the breeder who retails to the home trade or furnishes butchers with meat that is to be consumed locally, a neat, sanitary, and inexpensive package can be made by arranging the pieces of the cut-up fryer on a paper plate. A piece of clear cellophane should then be placed over the carcass and secured to the plate by a string (fig. 33).

SKINS

There is a demand for good rabbit pelts supplied in large quantities; but raw-fur buyers do not as a rule purchase pelts in small lots,

as the expense of handling is almost as much as for a large number. Some buyers will accept a few hundred pelts at one time, but the majority prefer to purchase in quantities of 25,000 to 100,000. This has made it difficult for most American breeders, who keep only a limited number of animals, to market skins to advantage. They have consequently been obliged to sell in small quantities at almost any price offered, or to hold skins until the necessary large shipments can be accumulated, a practice that is usually inconvenient or impracticable because of lack of proper facilities.

The possibility of developing a large, steady market for pelts depends much on the breeders' ability to furnish the types of rabbitskins required by the fur trade and to organize central collecting agencies that can accumulate pelts and sell them in large quantities. Scattered over widely separated areas, and in most instances unfamiliar with the demands of the fur trade, rabbit breeders have made little effort to sort and grade their skins or to combine their shipments so as to offer larger quantities at one time and thus realize better returns. The profits in some cases have gone to buyers or middlemen who purchase skins from the breeders at low prices and sell them in larger quantities at much higher prices.

Enormous quantities of rabbitskins are used annually by the fur trade, largely because the processes of plucking, shearing, and dyeing have been so perfected that good imitations of the more expensive skins of other animals can be produced. Another reason for the enormous consumption is the fact that rabbitskins are available as a byproduct of another and more profitable industry—production of rabbit meat.

Only prime full-furred skins should be used by fur manufacturers; poorer grades are used by hat-felt makers. Unprime skins, however, are generally used by the manufacturer of the cheaper rabbit coats, which never give satisfaction to the wearer and tend to discredit the better garments. Other things being equal, white, red, and blue skins, in the order named, are in greatest demand. White skins find the most ready market with the fur trade because they can be used in their natural color or dyed any desired shade. For this reason white domestic rabbits have become increasingly popular even where meat production is the primary aim.

Some rabbitskins are used in their natural colors, but this use is restricted because the breeder cannot so readily control production as can the dyer. Even apparently well-matched raw skins become poorly matched after being dressed, and a large quantity of natural-colored skins must be available to permit proper matching. Red and blue skins can be dyed many of the fashionable shades or used in their natural state undyed; but grays, browns, spotted, silvers, and most

others are mixed together and dyed black or some dark color. The bleaching process has been so perfected that rabbitskins of any color can now be made almost white at little cost and then dyed the more delicate shades. Large skins grown on the more mature rabbits during the colder months are the most suitable for the fur trade.

Most of the skins from domestic rabbits raised in the United States are used at present in the felt-hat trade because more money is made with commercial rabbits by selling them just as soon as they have attained a marketable weight. At this age the skin is small, the leather lacks strength, and the fur appears flat, mats, and does not have the good wearing qualities of fur from older rabbits. The majority of domestic rabbitskins taken from animals up to 6 months of age have a mottled appearance, which is due to the contrast between old fur only partly shed and patches of ingrowing new fur. The new fur grows at a different angle from the skin, and the fiber has a different structure. If when stroking a live rabbit from the tail towards the head, an intermixture of long and short hairs is noted, and if the fur flows unevenly under the hand, the skin is unprime.

Even in the skins of domestic rabbits there is great variation in density and quality, depending upon the degree of care that the various breeders give to these points in their selective matings. Breeders should give more consideration to the these points, even though the fur at present is used largely by the hat trade. Better skins will command higher prices. Improved methods of dressing may make the fryer rabbitskin more readily usable in fur garments.

CURING

While still warm, skins to be cured should be placed flesh side out, the fore part over the narrow end of wire or board formers or shapers, care being taken to remove all wrinkles. Satisfactory skin shapers can be made from No. 9 galvanized wire 5 feet long. This equipment has been called a "stretcher," but the term may give an erroneous impression; it is not desirable to stretch the skins unduly, as this tends to weaken certain parts and also open the fur. Skins should be so arranged on the shaper as to have the four legs on one side (fig. 34) and thus avoid any possible injury to the back fur, which is the most valuable. On the day after skinning, the pelts should be examined to see that the edges are drying flat and that the skin on the front legs is straightened out.

Rabbitskins should not be dried in the sun or by artificial heat, and they should be hung in such way as to have the benefit of free circulation of air. All skins must be thoroughly dry before being packed. If they are not to be shipped for some time after being dried they should be hung in loose bundles of 50 in a cool dry place away from

rats and mice. If they are kept any length of time in a warm climate or during summer they should be sprinkled with naphtha flakes. Salt should never be used in curing rabbitskins.

PACKING AND SHIPPING

To avoid spoilage or damage in transit, great care should be taken in packing skins for shipment. The fur should always be left inside,

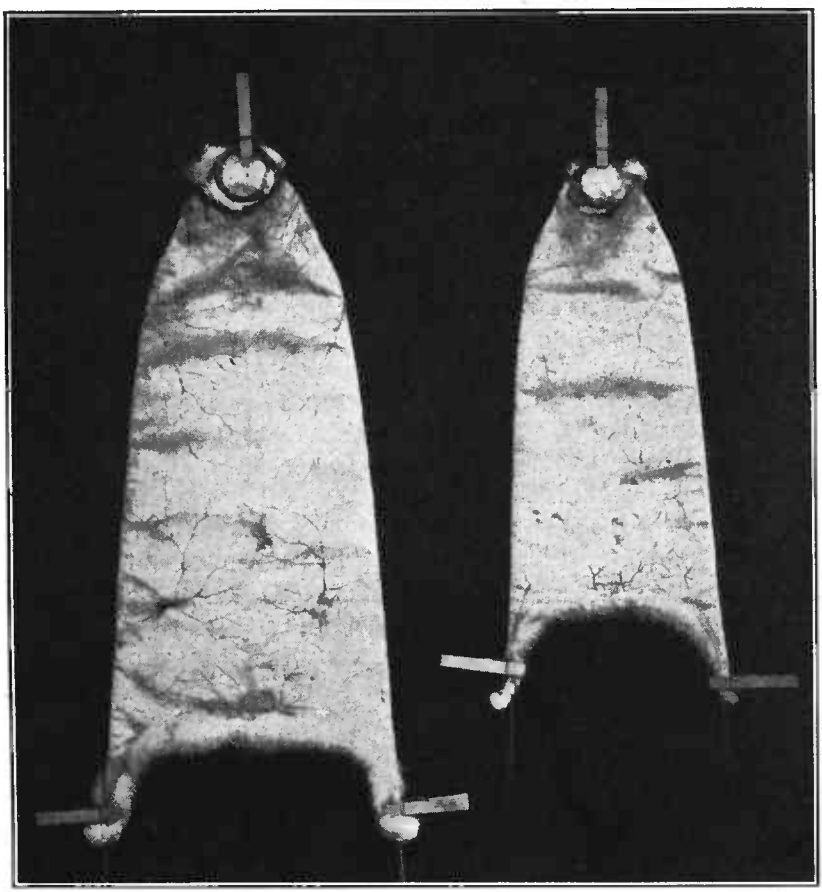

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***Figure 34.*—Proper way to place a rabbit pelt on a shaper, or stretcher, with all the legs on the same side.**

and so far as possible the skins should be kept in the same shape as when removed from the form. Each one should be examined carefully to make sure that it is properly dried. A moist pelt or one that has patches of oily fat on it should not be packed or shipped.

Pelts that have been examined and are ready for shipment should be laid out flat, one overlapping the other, and made up into bales. Every two or three layers of skins, as they are being packed together

should be sprinkled with flaked naphthalene or paradichlorobenzene to keep out insects that might damage them in transit. When a bale has been finished it should be wrapped in paper and covered with burlap, sewed with strong cord or binder twine, and properly marked. Skins should always be well protected in this manner before being shipped.

SORTING AND GRADING

If the best prices are to be obtained, rabbitskins must be carefully sorted and graded for quality, color, and size. No mixed shipments should be offered, for if good and poor skins of different sizes and colors are mixed, the entire shipment is usually accepted at the price of the poor skins.

Raw-fur buyers usually grade rabbitskins as firsts, seconds, and thirds. Firsts and seconds are also divided into five classes, based on color: White, red, blue, chinchilla, and mixed. Some furriers also grade firsts and seconds as large, medium, and small. The white, red, blue, and chinchilla skins should each be packed and shipped separately, whereas skins of all other colors may be put together.

Firsts are prime pelts of large size, well-shaped, and properly stretched and dried, having all the hair and underfur intact, and the skin side free from fat, flesh, dark spots, streaks, and cuts. The thicker and denser the underfur on a pelt, the more valuable it is and the better price it will bring.

Seconds are pelts that have shorter hair and less underfur than firsts, and, except in white pelts, the skin usually shows dark spots or streaks, and sometimes large black splotches. The skin of a white pelt is white, even though the fur is poor. Seconds also include pelts that are improperly shaped and dried, that have rubbed in shipment, or that show the poor spots where the skin has been pierced or the hair is short or missing.

Thirds are pelts with short hair and thin underfur and those from animals taken too young or while shedding. Pelts that are badly cut or otherwise mutilated and poorly stretched and dried also are classed as thirds. Thirds are of no value to the furrier and the underfur is used exclusively in the manufacture of felt for hats and the shredded skin for glue.

TANNING SKINS FOR HOME USE

Rabbitskins to be sold should not be tanned before shipment; fur buyers prefer to purchase them in the raw state. If intended for home use, however, they may be tanned by the methods herein described, but it should not be expected that they will compare favorably in appearance and pliability with the product of a tannery or factory operated by experienced workmen and equipped with modern machinery.

In tanning, the first step is to get the skin thoroughly softened, clean, and free from flesh and grease. If cased, or whole, the skin should be slit down the middle of the belly and then soaked in several changes of clean, cool water. When it becomes soft, it should be laid over a pole or board and work begun over the skin side with a coarse file or dull knife, breaking up and removing the adhering tissue, flesh, and fat, and at the same time working the grease and oil out of the skin. It is useless to start tanning until all the tissue, fat, and grease have been removed and the skin has been made uniformly soft and pliable.

The thickness and condition of the pelt determine the length of time a skin must be soaked, some skins requiring 2 or 3 hours and others longer. A skin should be soaked until it is soft, but it should not remain wet longer than necessary, as the hair may start to slip. When the skin has been thus treated and is somewhat softened, it should be worked in lukewarm water containing 1 ounce of soda or borax to the gallon. Soap added to the water is also helpful in cutting the grease and softening and cleansing the skin. After the skin has been rinsed thoroughly in lukewarm water, the water should be squeezed out, but the pelt should not be wrung. Finally, the skin should be worked in gasoline, which should remove the last particles of dirt and grease. It is then ready for tanning.

There are several methods of tanning rabbitskins. For a comprehensive treatment of tanning, the reader should consult Department of Agriculture Farmers' Bulletin 1334, Home Tanning of Leather and Small Fur Skins. Directions for using two of the more successful methods, known as the salt-acid and the salt-alum processes, are here given.

SALT-ACID PROCESS

The salt-acid formula calls for a solution made of 1 pound of common salt and one-half ounce of concentrated sulfuric acid to each gallon of water. Dissolve the salt in the water and carefully pour in the acid while stirring. This tanning liquor should be made and used in glass or earthen jars or wooden vessels, never in metal containers of any kind. When pouring in the acid, do not inhale the fumes given off. Be careful also not to get any of the strong acid on the skin or clothing. As soon as the salt-acid solution has cooled, it is ready for use.

Put the cleaned, softened skin in the solution so that it is entirely covered. After 1 to 3 days, during which it has been stirred frequently, remove it and rinse in clean, cool water. The skin should then be worked for about 10 minutes in a solution of 1 ounce of borax to 1 gallon of water. Rinse again in clean water and squeeze (but do not wring) as dry as possible. Work the skin a few minutes in the hands by rubbing and pulling, then tack it out flat, flesh side up, and

apply a thin coating of grease or oil and let it dry. Fresh butter, neats-foot oil, or olive oil are good for this purpose.

When the pelt is nearly dry but still damp, begin to work it with the hands, stretching it in all directions and working the flesh side over the edge of a board and pulling it back and forth as if shining shoes with a cloth. If the skin is rough, it may be smoothed by working it over a sandpaper block, which also helps to make it soft and pliable. Much of the success in producing a soft, pliable skin depends upon this repeated working, which must be done while the skin is drying out and not after it is dry.

If the skin is not soft enough when dry, it should be dampened and worked again as before. If still greasy, it may be given a hasty bath in gasoline. A final cleaning, accomplished by working the skin in warm, dry, hardwood sawdust, is beneficial and will add to the luster of the fur.

SALT-ALUM PROCESS

The salt-alum formula calls for 1 pound of ammonia alum (ammonium aluminum sulfate) or potash alum (potassium aluminum sulfate) dissolved in 1 gallon of water; and 4 ounces of washing soda (crystallized sodium carbonate) and 8 ounces of common salt dissolved together in one-half gallon of water. Pour the soda-salt solution slowly into the alum solution while stirring vigorously. Mix the combined solution, as used, with sufficient flour to make a thin paste, first mixing the flour with a little water to prevent lumps.

The skin, cleaned and softened as previously described, should be tacked out smoothly, flesh side up, on a board and then coated about an eighth of an inch thick with the tanning paste and protected with paper or sacking laid on lightly so as not to come in close contact with the paste. The next day scrape off most of the paste and give another coating. At intervals of a day repeat this application two or three times, depending upon the thickness of the skin. Only thick skins from mature bucks will need as many as three applications. Leave the last coating on for 3 or 4 days. Finally, scrape off the paste, work the skin in borax water, rinse and squeeze it, and then stretch and work it over a board in the manner described for the salt-acid process.

The salt-alum process is widely used and is considered slightly better than the salt-acid tannage, although alum-tanned skins often come out stiff and hard and require much working to make them soft and pliable.

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